5715

M113 Armored Personnel Carrier

David Doyle

Walk Around®

Don Greer 2009

Squadron Signal® Publications

M113 APC

by David Doyle

Walk Around®

Covers and art by Don Greer
Illustrations by Matheu Spraggins

Squadron Signal Publications

Introduction

The M113 family of vehicles is arguably the most successful series of armored personnel carriers of all time. Produced in huge numbers, they served with U.S. forces and their allies across the globe from the early 1960s into the 21st century.

Combat experience in World War II pointed to the need for a fully-enclosed armored personnel carrier in place of the open-topped conveyances that typified personnel carriers of that conflict. The first mass-produced fully-enclosed U.S. armored personnel carrier, the M75, was largely successful, as proven in combat in Korea during 1953. It was, however, extraordinarily expensive. The M75 used parts common to other tanks operating at the time, so the vehicle was robust and reliable, but in many ways was a case of engineering overkill.

With the concept proven in combat, efforts were made to refine and lighten the vehicle so that it could be airmobile and amphibious. The Army standardized the resultant vehicle as the M113 in April 1959, and production began under contract with FMC in 1960.

Until the Bradley Fighting Vehicle superseded it decades later, the M113 (and its successors, the M113A1, M113A2, M113A3, etc.) served as the U.S. Army's standard armored personnel carrier. While largely phased out of U.S. military use by the Second Gulf War, the M113 continued to serve many other nations. Despite oft-published reports, the vehicles never received an official name and were known to their crews as "tracks" or "one-one-threes."

The M113 holds 11 passengers. At the rear of the vehicle is a small door, through which personnel can pass one at a time. For more rapid egress or entry or for cargo hauling, the hydraulically-operated ramp, in which the small door is mounted, can be lowered. The driver, who accesses the fighting compartment through an overhead hatch or via a small passageway, sits in the left front of the vehicle, with the engine and transmission to his right. Four M17 periscopes surround the driver's hatch, which is also fitted for an M19 infrared periscope.

Located behind the driver and power plant is the commander's station with a cupola fitted with five M17 periscopes and a M2 HB machine gun. The unusual, hydraulically tensioned track could propel the amphibious M113 in water, but with only 14 inches of freeboard when in water, this feature was rarely if ever used.

The initial-production M113 was powered by a Chrysler 75M V-8 gasoline engine, driving through an Allison TX200-2 transmission, but work on a diesel-powered version began early on. A version powered by the General Motors 6V53 V-6 diesel engine was standardized as M113A1 in May 1963. The V-6 diesel's power was transmitted to the track through an Allison TX-100 automatic transmission and a DS-200 controlled differential. Diesel is a less volatile fuel and priority was given to equipping units in Vietnam with the M113A1 variant. Accordingly, by 1 July 1968, all M113s in Vietnam had diesel engines.

Acknowledgments

All photos by the author unless otherwise stated.

This book would not have been possible without the generous assistance of Tom Kailbourn; Doug Kibbey; Allan Cors and Marc Sehring at The National Museum of Americans in Wartime; Randy Withrow and his staff at the Veterans Memorial Museum, Huntsville, Alabama; Paul Baillargeon; John Adams-Graf; Scott Taylor and especially Denise Moss – who patiently traveled with me coast to coast as we photographed the vehicles for this volume.

About the Walk Around®/On Deck Series®

The Walk Around®/On Deck® series is about the details of specific military equipment using color and black-and-white archival photographs and photographs of in-service, preserved, and restored equipment. *Walk Around*® titles are devoted to aircraft and military vehicles, while *On Deck*® titles are devoted to warships. They are picture books, focusing on operational equipment, not one-off or experimental subjects.

Copyright 2009 Squadron/Signal Publications
1115 Crowley Drive, Carrollton, TX 75006-1312 U.S.A.
Printed in the U.S.A.

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form by means electrical, mechanical, or otherwise, without written permission of the publisher.

ISBN 978-0-89747-595-2

Military/Combat Photographs and Snapshots

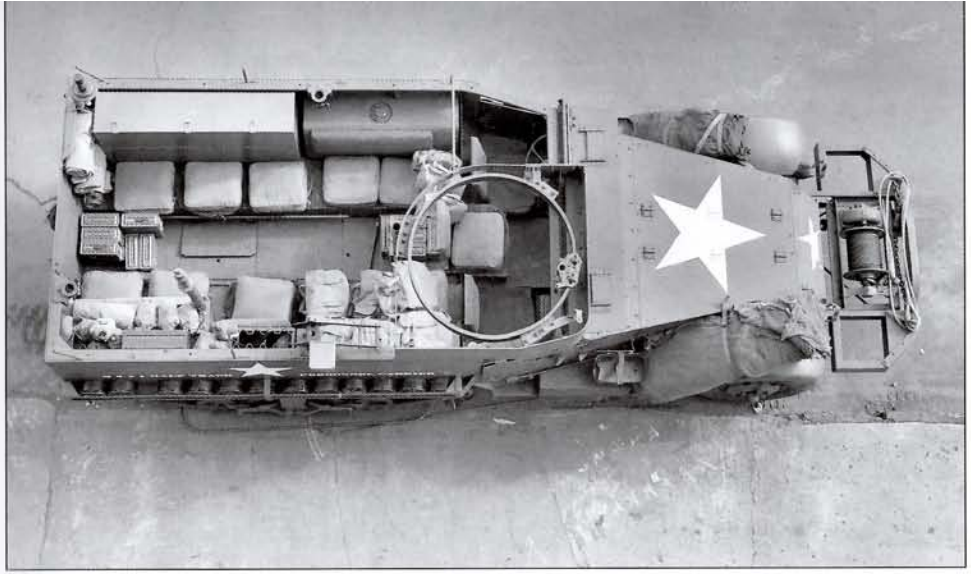
If you have any photos of aircraft, armor, soldiers, or ships of any nation, particularly wartime snapshots, please share them with us and help make Squadron/Signal's books all the more interesting and complete in the future. Any photograph sent to us will be copied and returned. Electronic images are preferred. The donor will be fully credited for any photos used. Please send them to:

Squadron/Signal Publications
1115 Crowley Drive
Carrollton, TX 75006-1312 U.S.A.
www.SquadronSignalPublications.com

(Title Page) M113A1s of Company B, 2nd Battalion (Mechanized), 2nd Infantry Regiment, 1st Infantry Division prepare to conduct a sweep near Minh Than at the end of February 1970. As usual, there is a surplus of stored gear on the vehicles, including two shovels above the trim vane of the nearest vehicle. In addition to the flotation cell on the trim vane, extra flotation cells are mounted on the glacis on either side of the trim vane.

(Front Cover) An M113A1 ACAV from the 9th Division crosses a creek outside of Fire Support Base Bastogne *en route* to joining a convoy on 16 April 1968.

(Back Cover) The commander of an M113A1 of the 11th Armored Cavalry opens fire with his .50 caliber machine gun during a nighttime fire fight.



During World War II, the U.S. Army's principal type of personnel carrier was the M3 family of half-tracks. Shown from above in a file photo dated on 1 March 1944 is a Diamond-T M3A1 half-track. It featured a machine gun mount over the front passengers' seats, and seating for ten more in the back. Its armor was thin, and there was no overhead protection, but it delivered the troops where they were needed. (TACOM LCMC History Office)

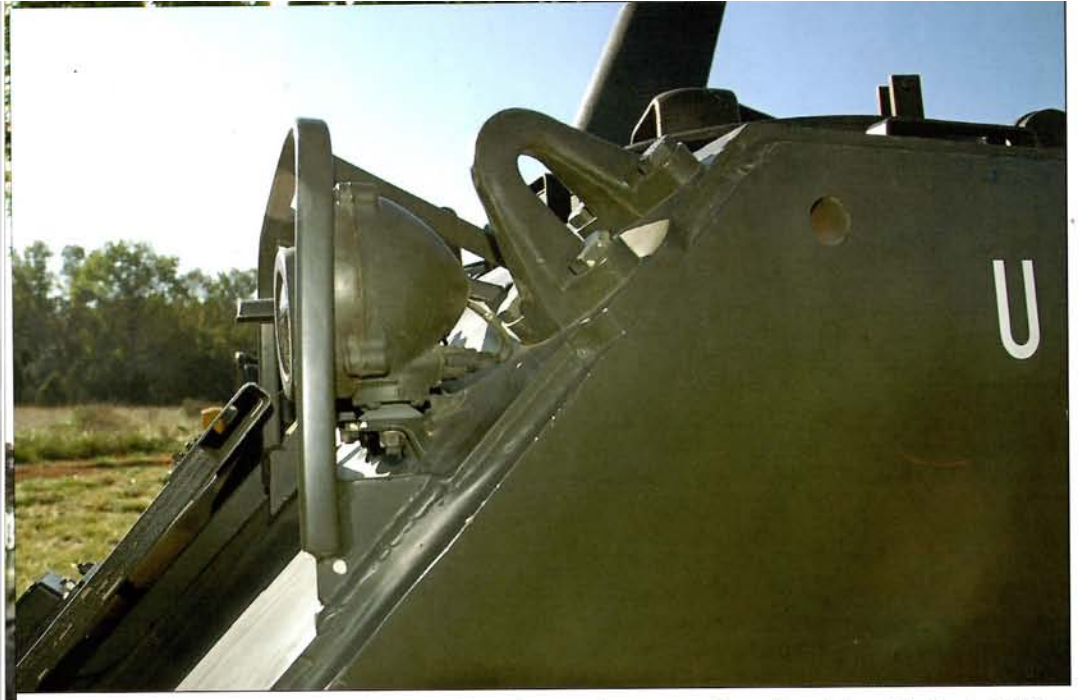
Lined up at the Aberdeen Proving Ground on 3 October 1952 are (left to right) the T73, T59, and T18E1, three pilot armored personnel carriers developed in the early 1950s. The T18E1 proved too expensive to produce in large numbers, and the T73 lost out to the T59 in operational tests. Standardized as the M59, that vehicle was somewhat similar in shape and design to the later M113. (Patton Museum)

An early M113 undergoing tests on a sandy trail is in a fairly stripped-down configuration, showing no radio antennas, pioneer tools, or spare track shoes. (TACOM LCMC History Office)

An early M113 demonstrates its fording abilities during testing. Instead of U.S. Army and registration number markings on the upper front side of the hull, this vehicle features temporary identification numbers sprayed on the glacis. There is a circular, dark- colored access plate next to the engine compartment door. (TACOM LCMC History Office)

An M113A1 belonging to the Patton Museum is decked out with Vietnam-era gear, including M1 helmets with camouflage covers. It is also fitted with ACAV machine gun shields.

Technically, this vehicle is an XM113, the number-three preproduction pilot M113, built by FMC in the late 1950s, but for the purpose of this book it will be referred to as the third pilot M113. It is currently in the collection of the National Museum of Americans in Wartime. It has been fitted with shields for one M2 .50-caliber and two M-60 7.62mm machine guns. It is wearing the black rubber track shroud and the metal front and rear shroud covers, all of which were commonly removed from M113s during service in Vietnam.

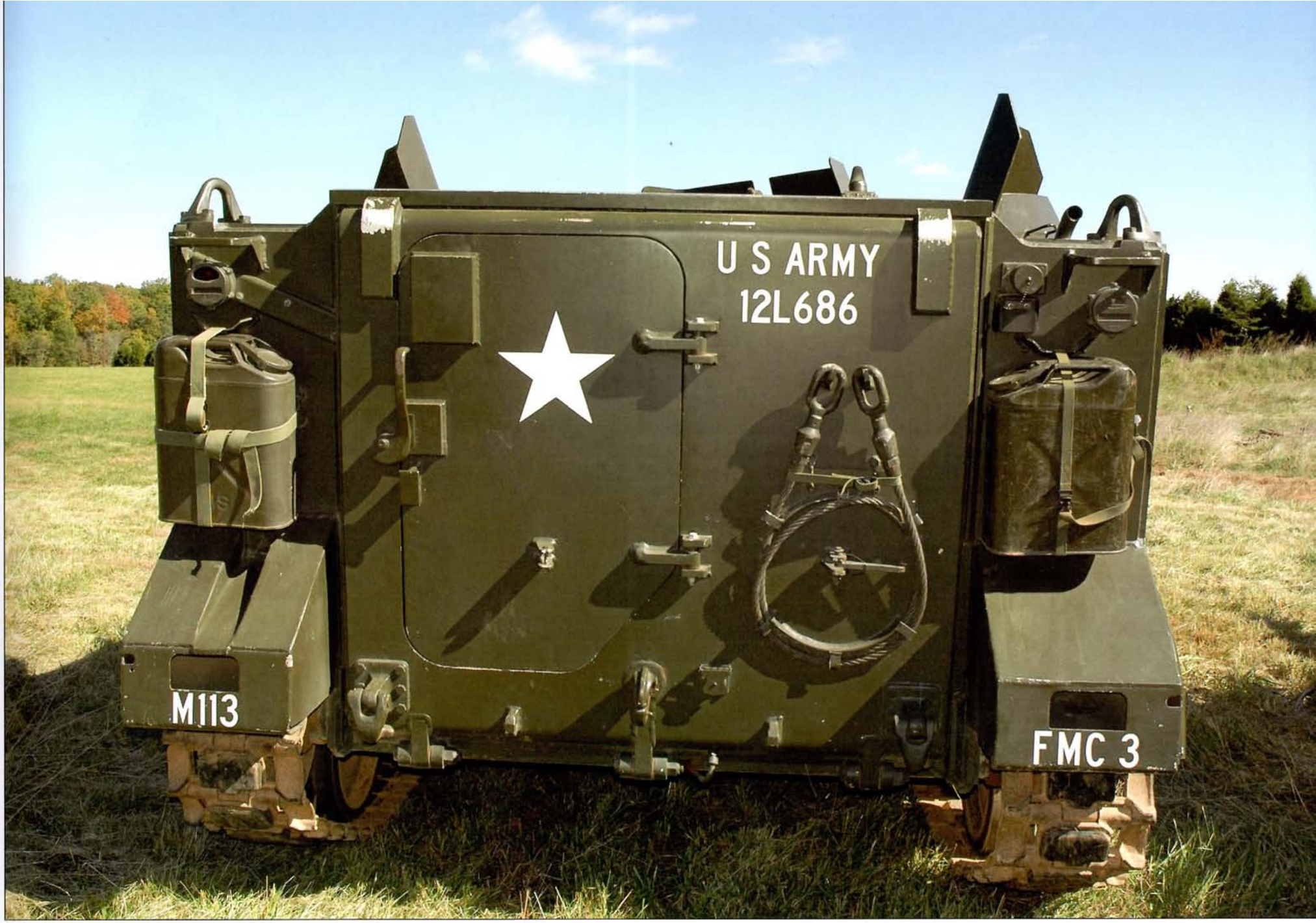


The left headlight assembly and brush guard are seen from the side, with the left lifting eye above, and the upper part of the trim vane to the left. The round opening at the upper corner of the side of the hull is the outlet for the bilge pump.

At the rear of the vehicle is the two-wheel idler assembly with staggered spokes. The track center guides fit into the channel between the two wheels. The heads of the track pins that hold the track shoes together are visible.

Four hex bolts fasten the left, front shroud cover to the forward end of the left shroud to its right in this photograph. Below the cover at the front of the vehicle is the left drive sprocket. The outer ends of the track pins that hold the track shoes together are visible in this side view.

This M113A1 is painted in a MERDC four-color camouflage scheme, which was in use from 1975 until the mid-1980s. The black rubber track shroud is unpainted.

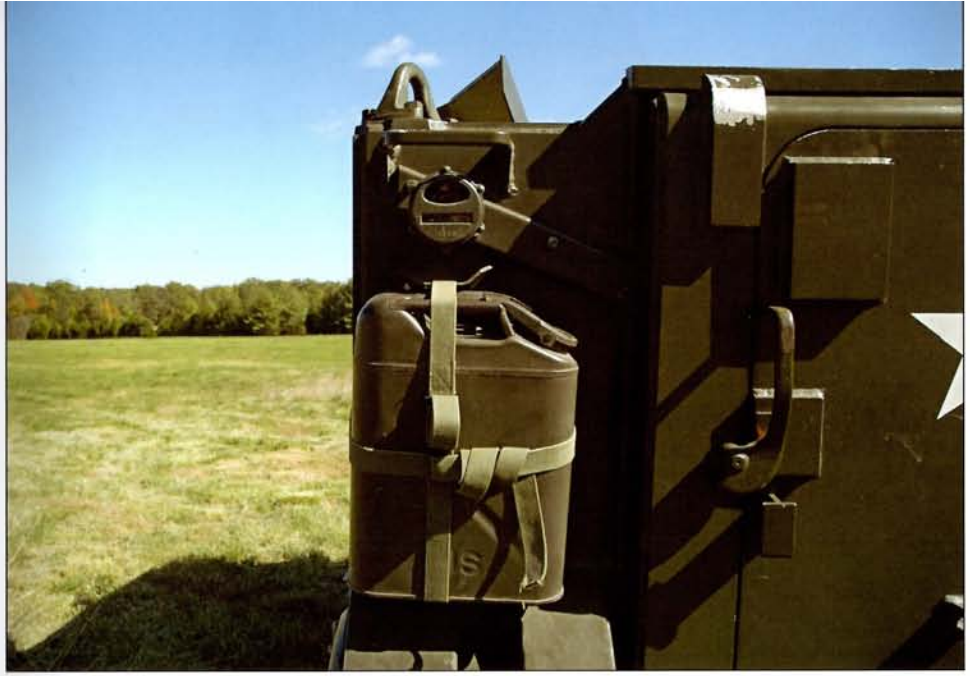


The rear of an M113, showing the raised ramp that occupies practically all of the rear of the hull. Inset into the ramp is a door, with a tow cable stored next to it. Strapped to either side are five-gallon liquid containers.

The ramp of the M113A1 (and the M113) is operated by a steel cable connected to the inside of the ramp and routed to a hydraulic cylinder under the floor of the personnel compartment. A valve in the driver's compartment controls the operation of the ramp.

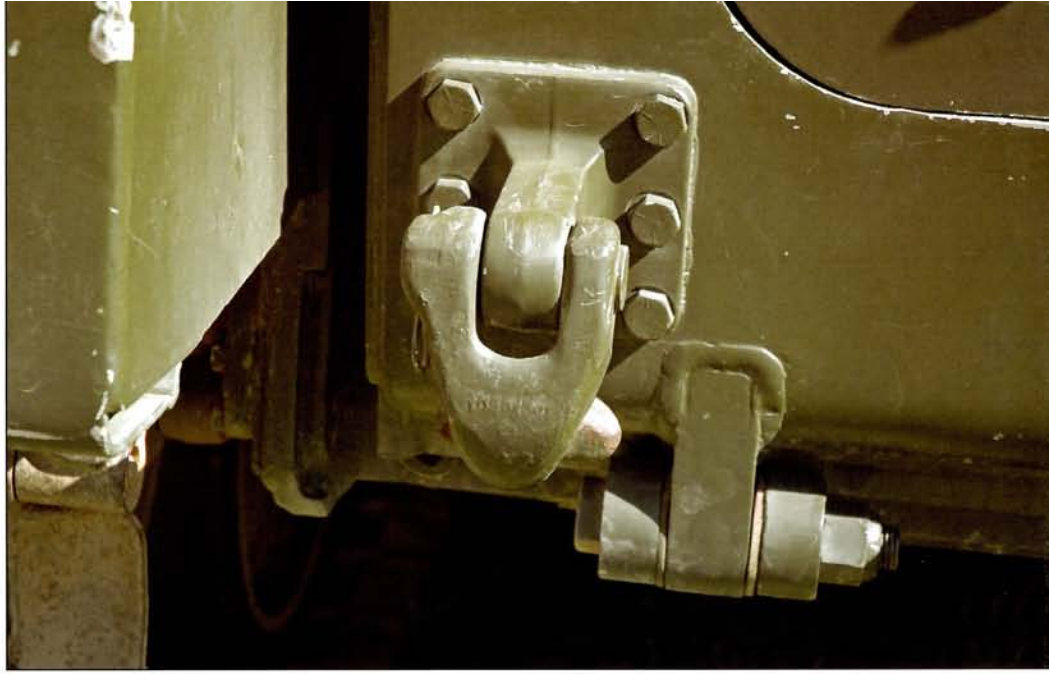
The M113 used T130E1 track shoes, a steel, single-pin, center-guide type with rubber pads. The M113A1s also used this type of track.

The open ramp door of an M113 provides a glimpse of the seats, personnel heater, and ceiling grab straps inside the personnel compartment. To the left of the door opening is the exterior door handle, which was to be left pointing down when the door was open.



Five-gallon fuel or water cans are stored on either side of the ramp by means of crossed, adjustable webbing straps. Above this can is the left tail light assembly with a combination brush guard/grab handle above it. The left tail light assembly consists of a service stop light/tail light on top and a blackout light below.

The left rear tow hook is adjacent to the inside face of the left fender.



To the right of the left, rear tow hook is the left hinge of the ramp. Above and to the right of the hook is the lower left corner of the ramp door.

The towing pintle of the M113 is mounted on the bottom center of the ramp. (This pintle is installed upside down, with the upper jaw and lock at the bottom.) The vertical bar welded to the ramp below the pintle is the ramp's center hinge strap.

To the right of the ramp door, in the center of the coiled tow cable, is the ramp door hold-open latch. The device to the right of the towing pintle is the electrical receptacle for trailer lights.

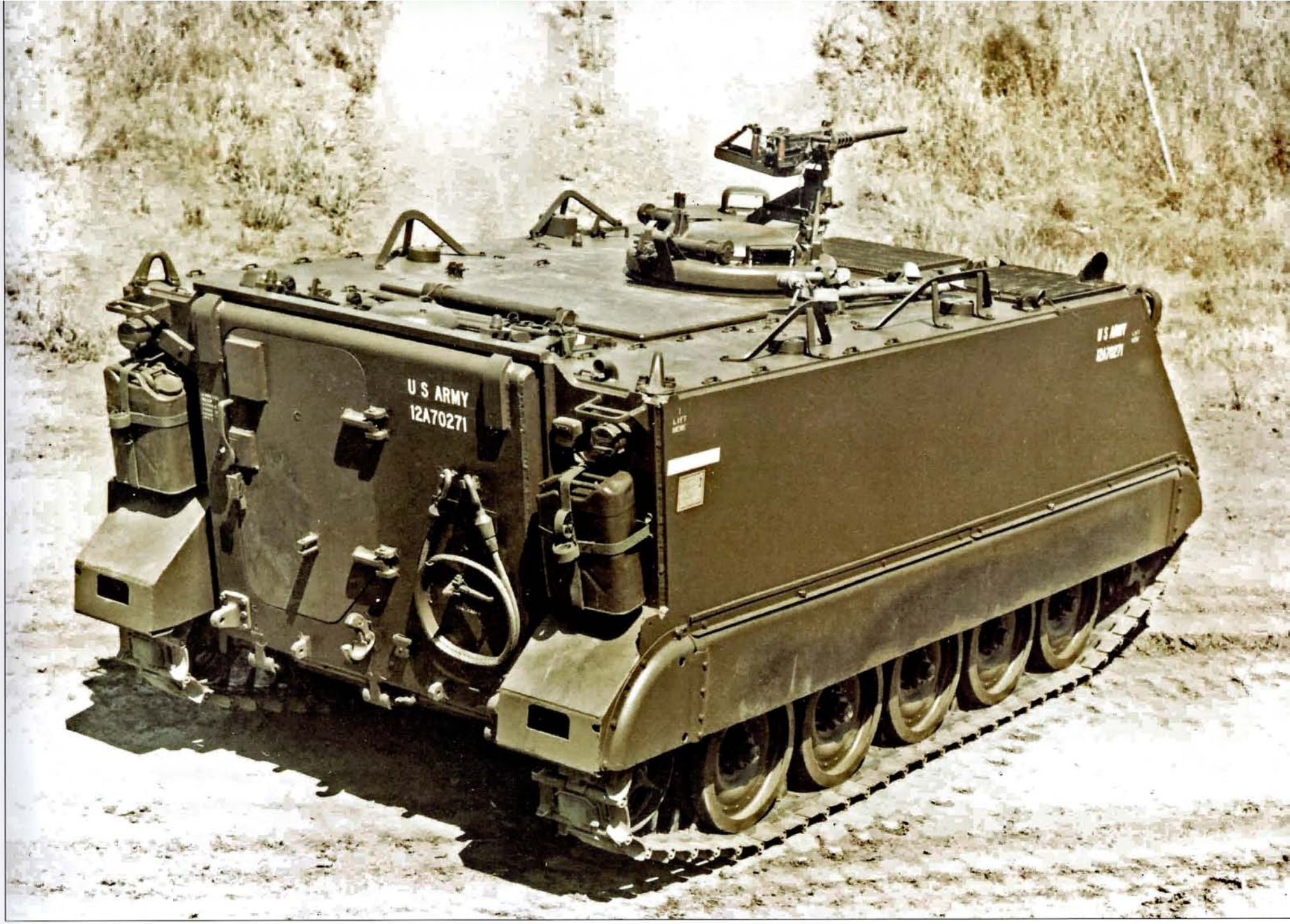
A large tie-down bracket welded to the rear of the hull below the tail light is used for the vertical strap that retains the liquid container, while smaller tie-down loops are used on the sides.

The right tail light assembly (right) consists of a blackout stop light (top) and blackout marker light (bottom). To the left of the tail light is the external AC receptacle, with a retainer chain attached to the round cover. Below the receptacle is a telepost, containing jacks for four external telephone lines.

The cutout in the fender at upper right lets it double as a step. Below it can be seen the inside of the right idler, with the right rear tow hook at upper left.

A three-quarters right rear view of the third pilot M113. The two rear machine gun shields are protruding above the top of the vehicle. The joint where the aluminum-plate armor panels of the body meet at the right, rear corner is offset, rather than flush. The pipe protruding from the right, rear corner of the roof is the rear bilge pump outlet. Lifting eyes are at both rear corners of the roof of the vehicle.

The Fort Knox M113A1 displays a typical field setting with an insulated food container (Mermite can) sitting on the ramp, and an assortment of ammunition boxes, web gear, crates, packs, and other gear stored in any available spot.



An early-production M113A1. The V-shaped brackets on the roof are guards for the bases of radio antennas, which are not installed in this photo. (TACOM LCMC History Office)

The basic M113A1 was externally indistinguishable from the M113. The main differences between the models were the substitution of the Detroit Diesel/General Motors 6V53 V-6 diesel engine for the M113's Chrysler 75M V-8 gasoline engine, and the Allison TX-100 automatic transmission for the M113's Allison TX200-2 transmission. (TACOM LCMC History Office)

Track shroud tension was adjusted by using a track connecting tool to install or remove screws holding the shroud covers to the fenders. One jaw of the tool fit into holes in the shroud cover (one is visible here) and the other jaw went into a hole in the rear fender.

The manner of attachment of the right rear track shroud cover (left) to the fender and track shroud (right) is illustrated in this photo. A long metal strip with an inverted L profile acts as a retainer for the track shroud.

The road wheels on an M113 are individually sprung by torsion bars and are fitted with 21-2.1" tires. The first and last road wheels on each side have shock absorbers.

The right drive sprocket at the right front of an M113. The spokes of the outer and inner sprocket wheels are staggered.

The Patton Museum's M113A1 has had the track shrouds and shroud covers removed, as was customary when deployed in Vietnam. The bridge classification symbol is visible on the glacis.

Two extra, heavy-duty lifting eyes, a feature found on some early M113s, are located at the sides of the glacis of this third pilot M113 located at the Virginia Museum of Military Vehicles.

In this overall front view of the third pilot M113, the box-like protrusion toward the right of the trim vane is capped with a flip-up cover that allows access to the linkage connecting the hinged extension (or brace) to the trim vane. By opening the door and releasing the linkage, the trim vane can be lowered, allowing access to the engine compartment.

The bolt-on left lifting eye, headlight and brush guard assemblies, and the joint where the side of the upper hull meets the glacis are seen here from the side. The trim vane is extra-tall because it has the bolt-on extension across the top that was fitted on some M113s.

The later-type exhaust and guard above the horn, introduced with the M113A2, are visible near the headlight array of the Knox M113A1.

The right headlight group includes the service headlight (left), blackout marker lamp (center), and infrared headlight (right), with the horn partially visible above it. Stamped twice on the glacis plates is: "PREPRODUCTION / M113 PILOT NO 3."

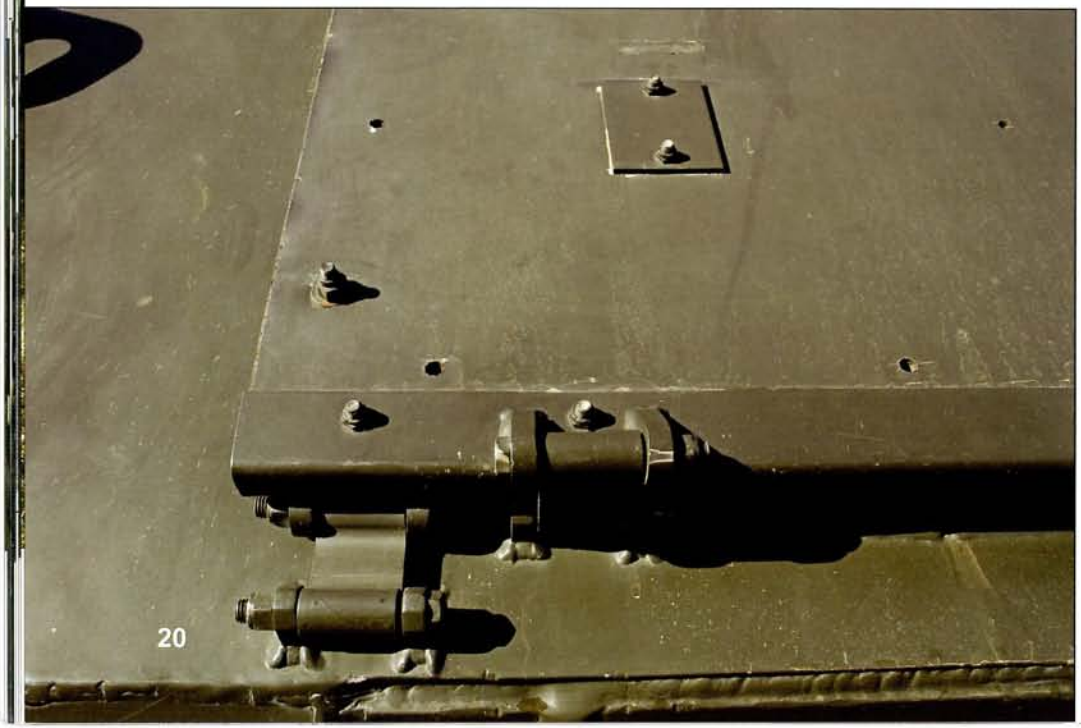
The left headlight group of the number-three pilot M113 features braces with gussets at the top of the brush guard, which is welded via a triangular bracket to the glacis. To the inboard side of the group is a blackout headlight.

The front bottoms of the headlight brush guards of the M113A1 are bolted to triangular lugs welded to the glacis. Stamped on the glacis below the outboard lug is "12 E 16869." This vehicle lacks braces at the top of the guard. There is a metal extension cap on top of the plywood trim vane.

The M113s have dual hinges on both sides of the trim vane.

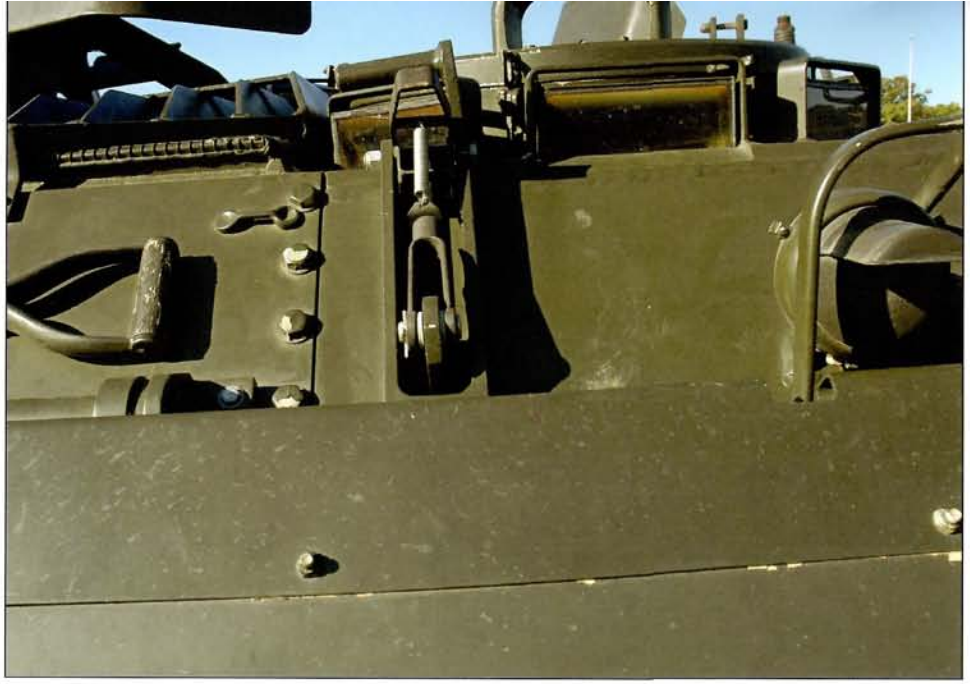
Part of the extension, the brace that holds the trim vane up and forward when deployed is visible over the top of the trim vane, adjacent to the left headlight assembly.

Provision was made to store a shovel on the top of the glacis above the stored trim vane. On the roof can be seen the exhaust and exhaust grill (left) and engine air intake grill (right). To the rear of the exhaust are a mount and guard for a radio antenna.



To the right of the shovel handle, at the top of the extension for the trim vane is the operating handle, directly above which is the brush guard for the driver's hatch-mounted M19 infrared periscope. Visible directly above the shovel is the shield for the M2 Browning .50-caliber machine gun. This shield is part of the ACAV kit.

An air deflector mounted above the grille blocks hot air from blowing on the driver. Also visible are the operating handle on the upper part of the stored extension for the trim vane and several of the driver's M17 periscope heads around the outside of the hatch.



The blackout headlight is at right and the trim vane operating handle is located at the center of this photograph. Above and two the right of the handle is the brush guard for the driver's hatch-mounted M19 infrared periscope.

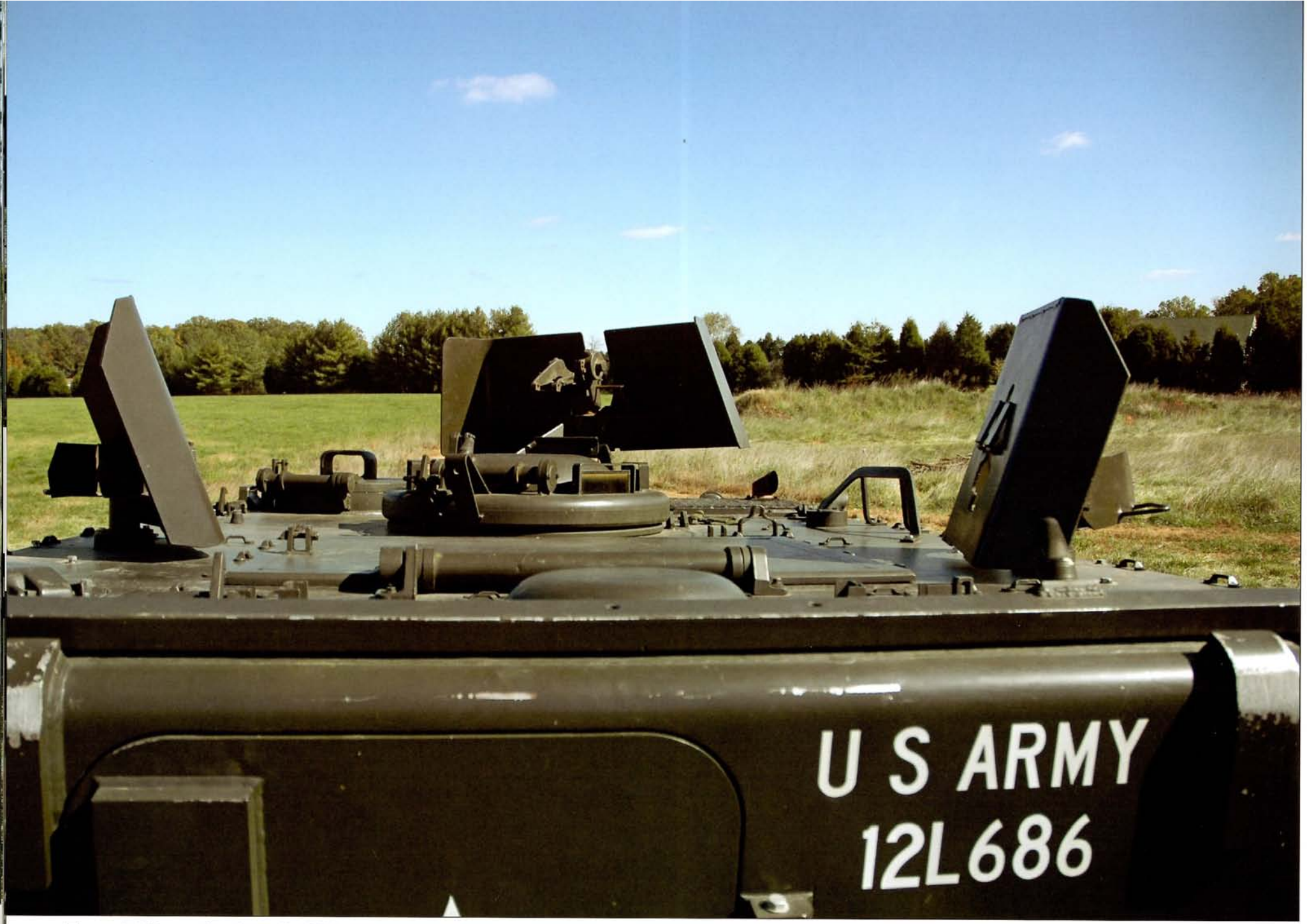
To extend the trim vane prior to operations on water, a crewman pushed the extension handle forward until a catch on the bottom of the extension locked onto a catch on the glacis. To retract the trim vane, the crewman released the catch and pulled the handle up and back until it locked in place.

The cover for the release mechanism of the trim vane extension is seen here close up. The trim vane release mechanism cover is hinged at the bottom and flips up. The trim vane at the front of the hull is deployed and the vehicle's bilge pumps are also switched on before the amphibious vehicle enters the water.

The trim vane extension handle (center of photo) and upper part of the extension are seen here from the roof of the third pilot M113.

The left headlight group and brush guard of the number-three pilot of the M113 from above, showing the two gusseted braces welded to the guard and the glacis.

The right headlight brush guard of the pilot vehicle is narrower than the left one, so it only received one gusseted brace. The electrical connection for the horn is visible left of the brace.



The roof of the number-three pilot M113 is seen here from the rear of the vehicle. The two rear machine gun shields are turned with their front faces inward.

The right rear lifting eye and rear bilge pump outlet are see from overhead. Projecting from the rear of the hull is the combination hand hold/tail light guard, which extends above the right rear tail light assembly.

The curved bilge pump outlet is made of thin metal and easily dented.

The left-rear lifting eye is photographed here from overhead. Below it, projecting from the back of the vehicle, are the left hand hold/guard and, underneath it, the left tail light assembly.

The left rear lifting eye and hand hold/tail light guard.

A hinged, armor casting protects the fuel filler cap. The filler cover on the third M113 pilot vehicle is on an oval, bolt-on plate that lies flush with the roof. To the left is the L-shaped release handle for the hold-open latch for the cargo hatch.

The cover for the air inlet to the personnel compartment is at the center at the rear of the roof. Small footman loops are located adjacent to it.

The hinge of the cargo hatch of the third pilot M113 has a torsion bar to aid lifting. When the hatch is open, the bracket on the side of the hatch engages the hold-open latch.

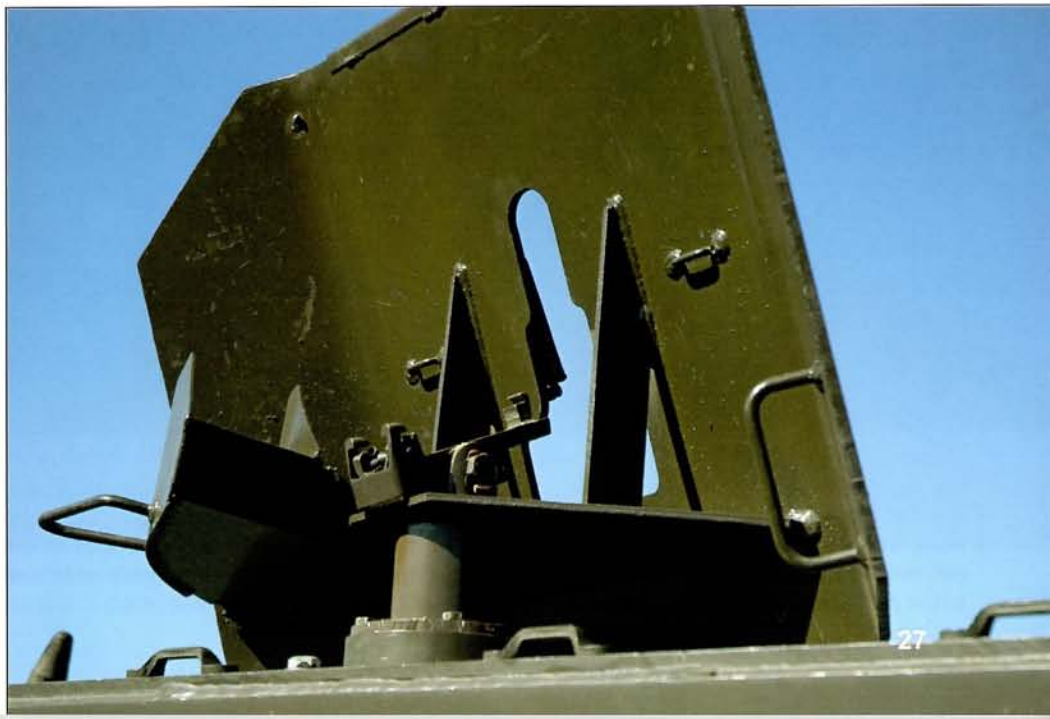
This picture reveals details of the cargo hatch hold-open latch and handle, with the rear of the vehicle to the left. The spring on the latch was a simple wire device. Footman loops helped secure equipment.

The hinged covers for the side extensions of the gun aperture are flipped up on the front face of the ACAV-style shield for the right rear machine gun on the third pilot M113.

In this view of the rear of the ACAV shield, the plate with the three round cutouts is the cradle for an M60 machine gun. The curved tray to the left holds linked ammunition. The grab handles were useful for swinging the shield and gun around.

The ammunition tray, cradle, and pedestal are seen here on the right-rear gun shield. To mount an M60 on the cradle, latches on the underside of the gun would engage three lugs on top of the cradle.

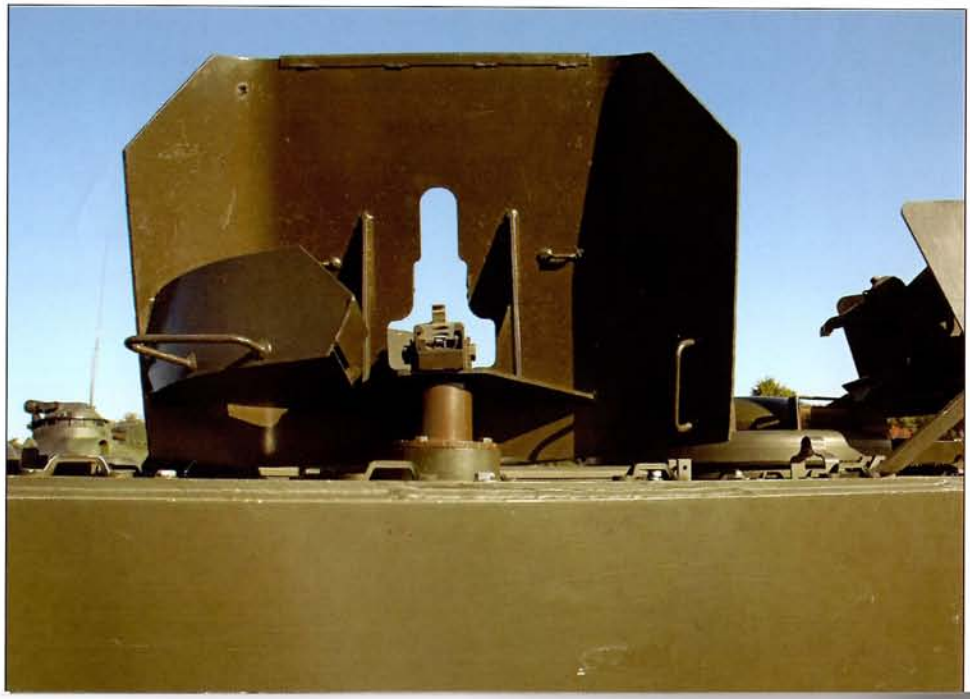
A flat plate and diagonal braces secure the rear ACAV gun shield to its pedestal, as seen here from underneath.

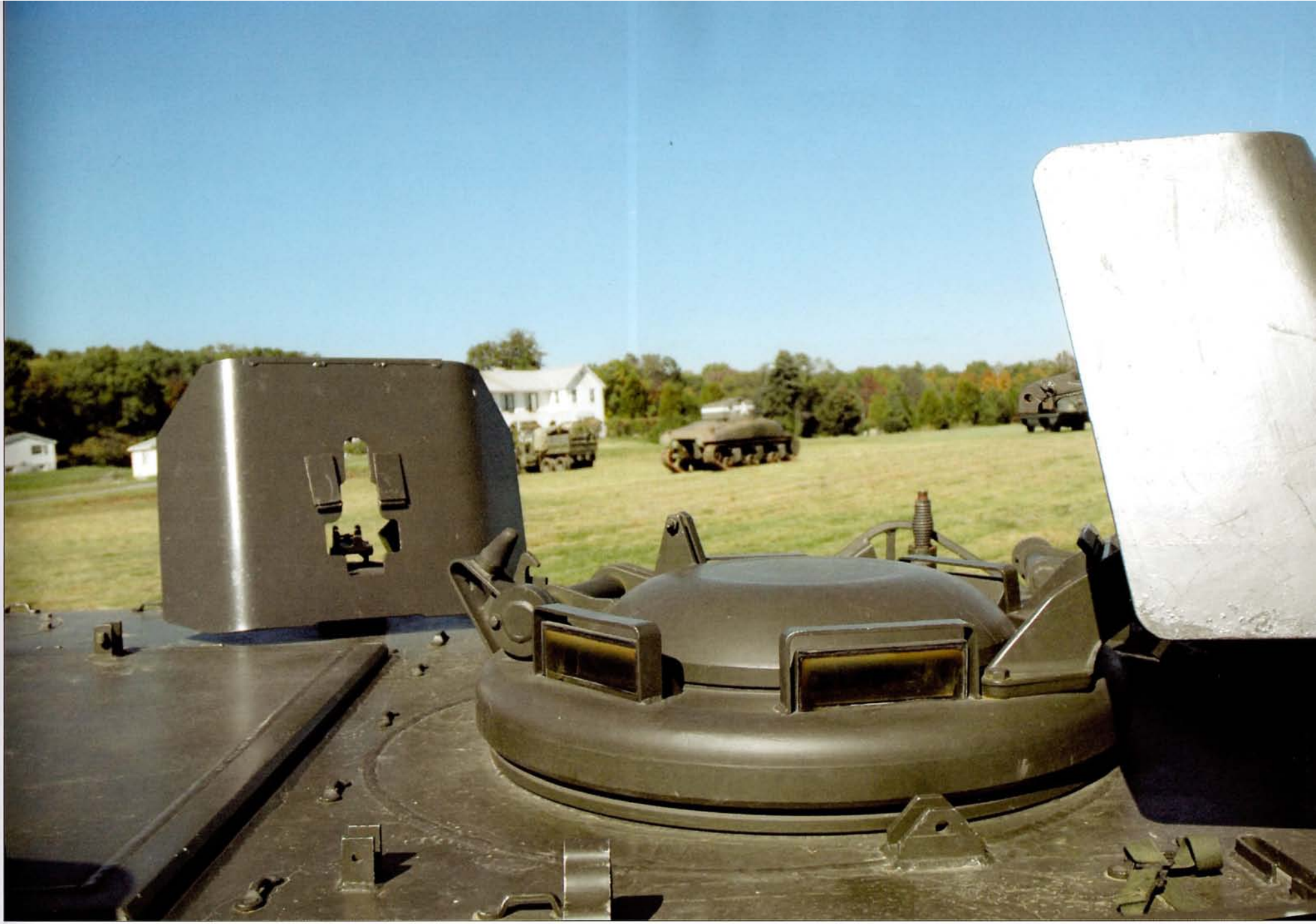


This revealing study of the ACAV shield and open turret of an M113A1 in Vietnam in the early 1970s shows many details of the position. Vertical stiffeners and cutouts for the periscopes are visible on the lower half of the turret. Fragmentation grenades are hung at the ready inside the turret, and more frag and smoke grenades, as well as an ammunition bandoleer, are stored on the outside the turret. A CVC helmet with intercom cable and an M16 rifle are propped up on the turret. (Doug Kibbey)

ARVN, and later U.S. troops, transformed the M113s from armored personnel carriers into fighting vehicles by mounting gun shields and extra machine guns. In 1966, FMC designed and began producing a gun shield kit that became known as the ACAV shields, comprising two shields with bent-back sides for M60 machine guns on either side of the cargo hatch, and a shield for the cupola-mounted M2 .50-caliber machine gun. The latter, shown in this photo, comprised a round, two-piece shield fitted to the top of the cupola and forming an open turret, and a separate frontal shield with bent-back sides.

The ammunition tray is to the left in this rear view of the ACAV shield.





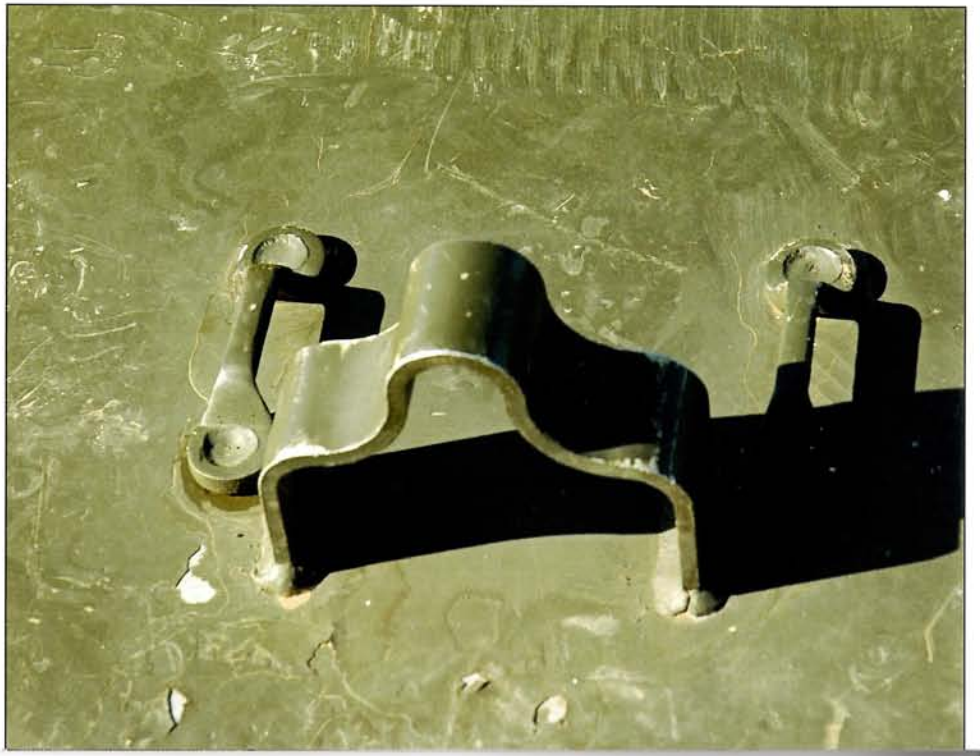
The commander's cupola and gun shield are seen on the third pilot M113. The left rear gun shield is to the left. Although the front ACAV-type gun shield was mounted on this particular vehicle at some point in its career, it lacks the ACAV open turret around and over the cupola. Several of the M17 periscopes around the cupola are visible.

A bolt-down guard fabricated from welded steel strips is provided for the radio antenna mount near the outer edge of the roof.

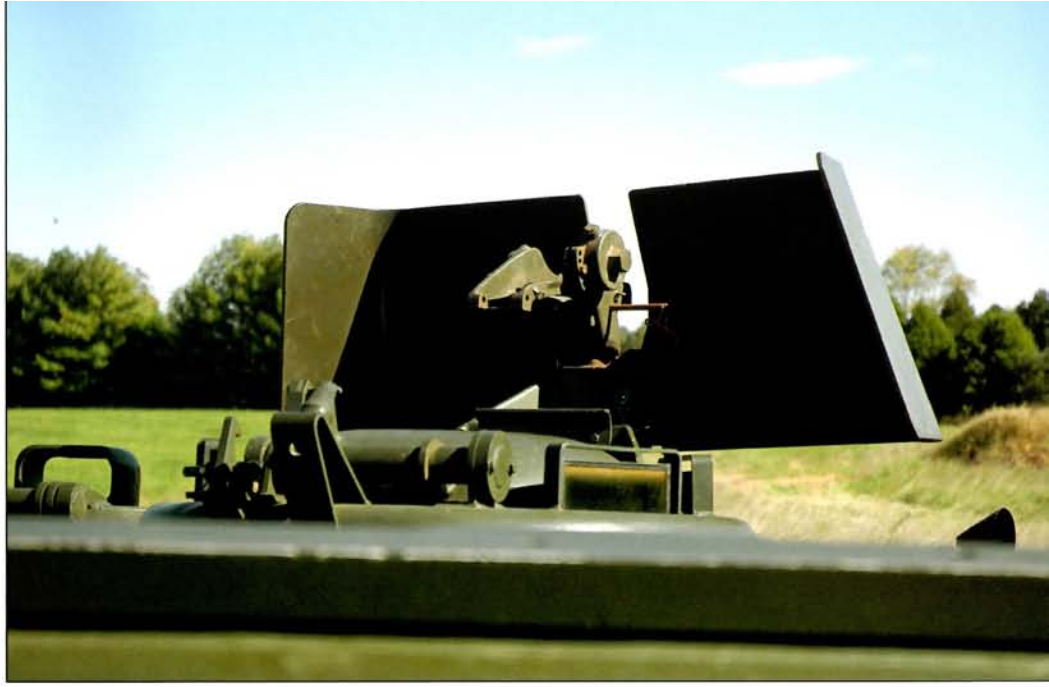
The elongated bracket in the foreground and, behind it, the raised bracket with protrusion on top held a .50-caliber machine gun tripod.

The rear bracket for the .50-caliber machine gun tripod is located adjacent to the cupola.

Footman loops are attached to the roof on either side of the tripod bracket. The texture of the aluminum alloy armor is visible in this photograph.



The fully-traversable cupola with one of its M17 periscopes and the machine gun mount are adjacent to the bracket that held the machine gun tripod.



Behind the commander's gun shield are the gun cradle and mount, to the right of which is the cylindrical spring equilibrator, which kept the gun horizontal.

The hinge of the cupola hatch incorporates a torsion bar, to assist in lifting it. On the bracket to the rear of it is a bumper stop for the hatch.

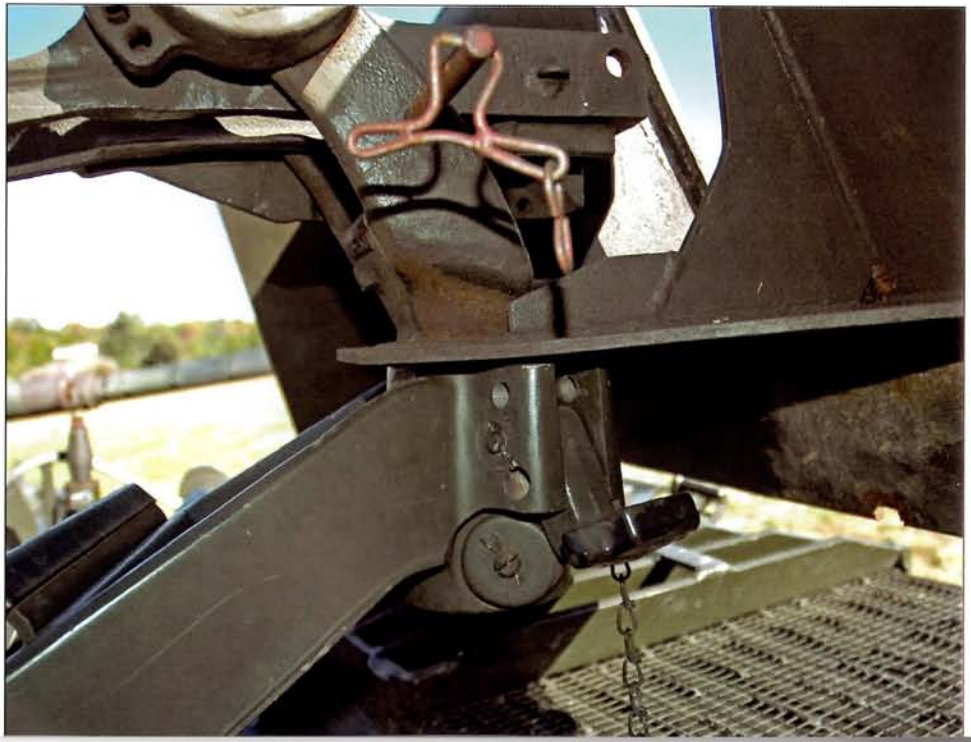
The head of one of the five M17 periscopes ringing the cupola. These periscopes were designed for daylight viewing.

The right cupola M17 periscope head together with its guard are seen in this view.

The front periscope head of the cupola is positioned between the legs of the machine gun mount, to provide an unobstructed forward view. This periscope lacks the guard that surround the other heads.

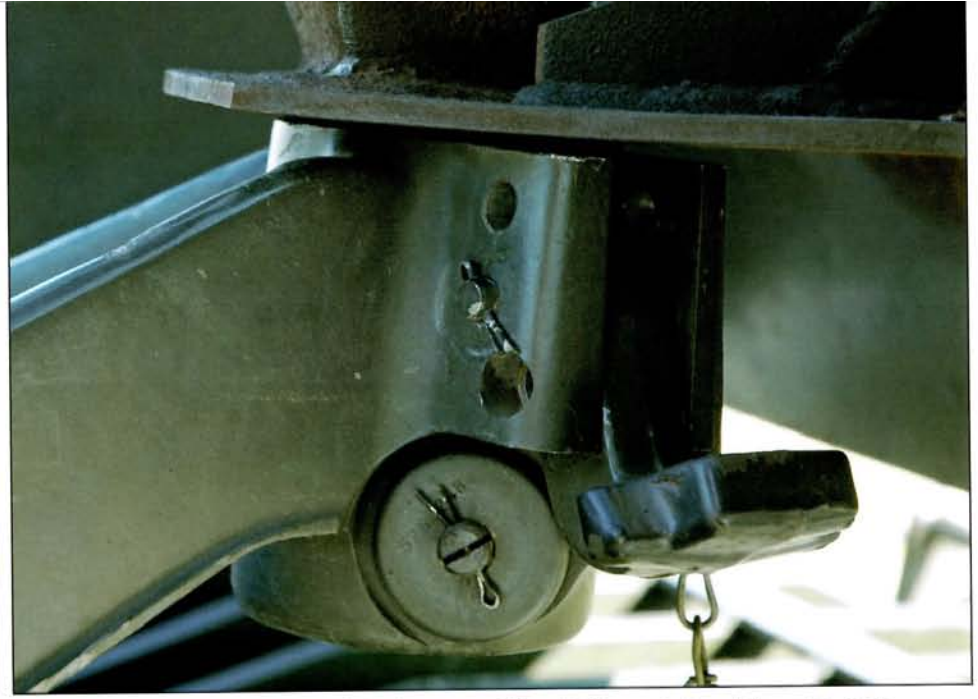
To the left of the cupola hatch bumper stop is the hatch hold-down latch, which engages to a catch next to the left hinge strap on the hatch when opened fully.

Below the horizontal support plate for the shield is a black control knob for the traverse lock, which keeps the gun from swinging side to side when not in use.



The driver's hatch is to the upper left in this overall view of the rear of the commander's machine gun mount and shield.

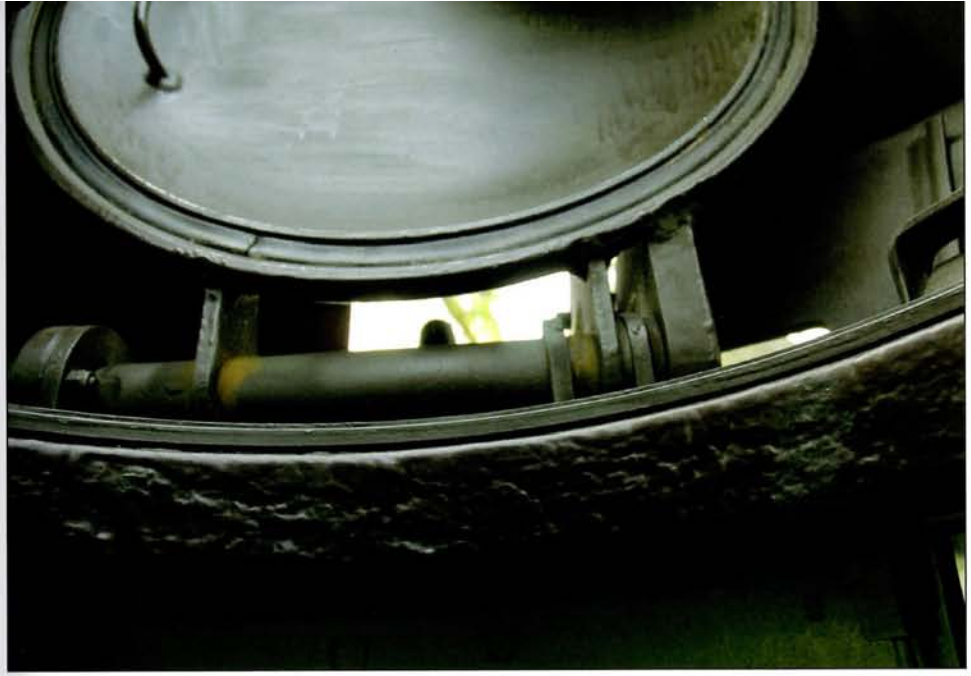
The .50-caliber pintle mount shield supports feature the part number cast on the surface near the bottom. The rusty pin locks the cradle's elevation. The holes at the front and rear of the cradle are for the pins that hold the M2 machine gun to the cradle.



This close-up shows details of the bottom of the pintle socket and traverse lock.

At the bottom of the turret are cutouts in front of each of the cupola's periscope heads. An M1 helmet hangs by a strap from the equilibrator, with the ACAV shield to the right.

In this view of the roof of the M113A1 facing toward the front left corner of the vehicle, with the rear of the ACAV turret to the right, a flashlight appears to the left of the cargo hatch hinge. Ammunition boxes are strapped down to the left. A boonie hat rests at the lower left and the flak vests are draped over the gun shield and turret.

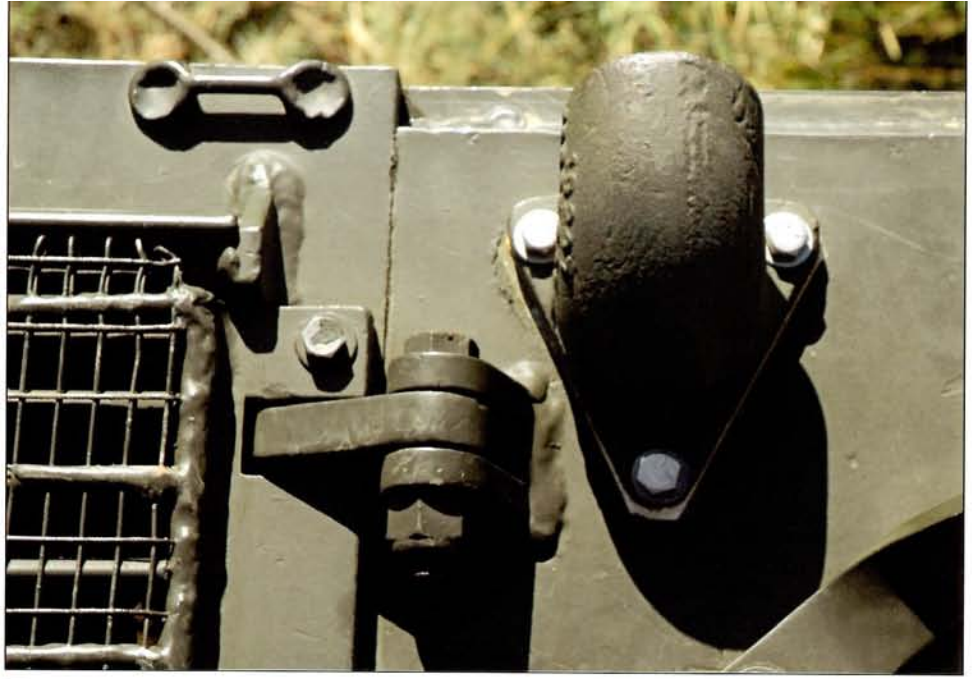


Surrounding the hatch opening in the cupola is a black rubber crash pad. A rubber weather seal also surrounds the perimeter of the hatch, on which is welded a grab handle.

A jumble of stored gear, including waterproof ponchos and tarps, an M1 helmet, a LAW (light anti-tank weapon) shoulder-fired rocket launcher, and M16 rifle, are seen here atop an M113A1.

The M60 machine gun was a mainstay of the U.S. armed forces from the late 1950s until recently. Firing a 7.62x51mm NATO round, it could lay down fire at a rate of about 550 rounds per minute at an effective range of about 1,200 yards. Two M60s mounted on rear gun shields were part of the ACAV kit on the M113 family.

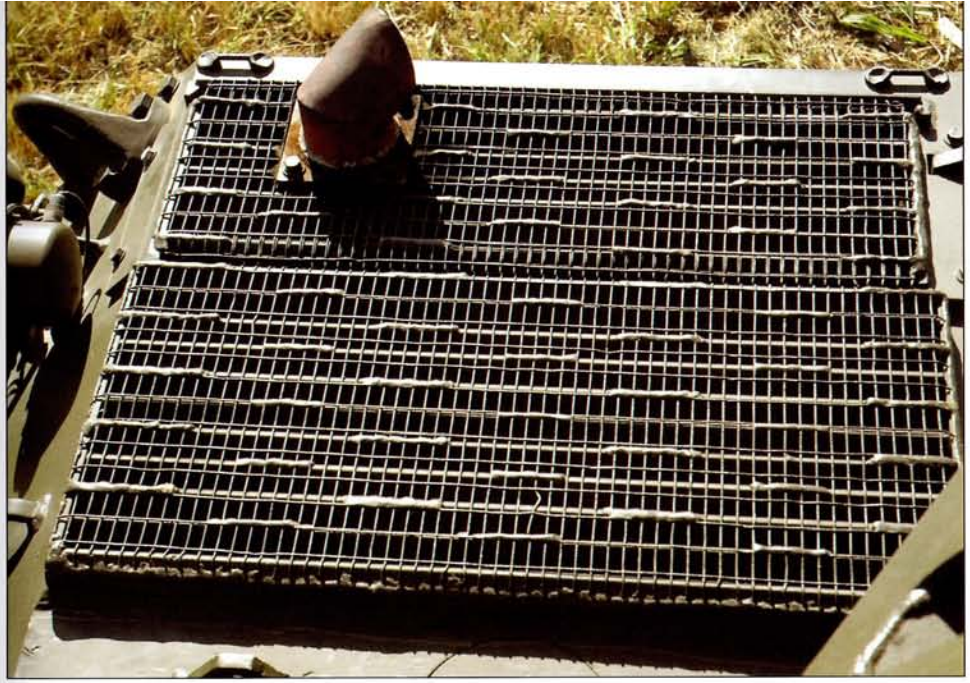
The exhaust outlet elbow for the personnel heater is on the right side of the roof to the rear of the power plant grille. Its part number is cast onto its forward side.



The personnel heater exhaust outlet and the outboard hinge of the power plant grille are viewed here from overhead. A footman loop is welded to the frame of the grill.

The power-plant grille of the third pilot M113 includes two component grilles: the engine exhaust grille (foreground) and engine air inlet grille (toward the driver's hatch). The well-rusted engine exhaust protrudes through the exhaust grill.

Shown here in the factory-installed position, the exhaust outlet was often remounted by troops in Vietnam so that it pointed to the right front. A cross-shaped reinforcing brace is welded to the inside of the engine exhaust.

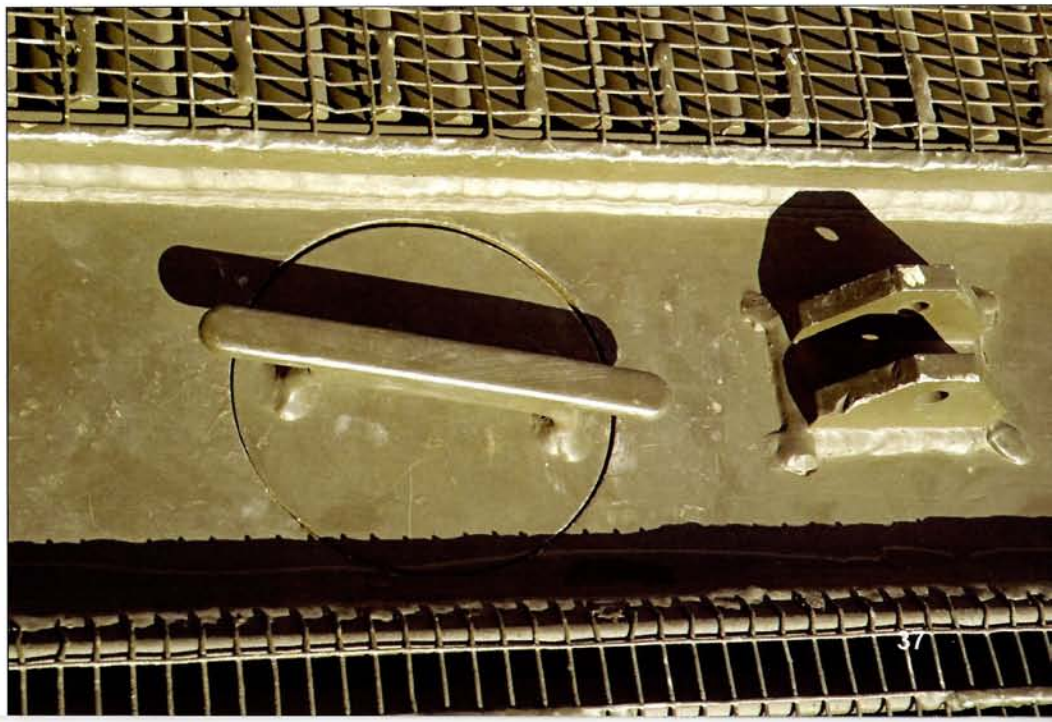


The engine exhaust grille is viewed here from the center of the roof. At the bottom of the photo is a plate separating the inlet and exhaust grills.

The left hinge of the power plant grille is on top of the grille that covers the engine cooling fan. Left of the hinge are the driver's hatch and the cupola gun shield.

The power plant grille is seen here from overhead. On the plate in the center of the unit is a bracket to which a support is attached when the grill is raised. Below the shovel is the top edge of the trim vane.

The coolant filler cover, between the engine inlet and exhaust grilles, has a raised handle and is removed by rotating it and pulling it out. It allows access to the coolant filler cap on the radiator. To the right of the cover is the hold-open bracket.



The driver's hatch has a hinge with torsion-bar assist. Four M17 periscopes provide daytime visibility from the left side to slightly right of forward.

Atop the driver's hatch is a rotating mount with guard for an M19 infrared night-vision periscope. Toward the outboard edge of the hatch is the hold-open catch, which engages with a sprung latch with a handle next to the radio antenna mount at upper left.

This view of the left side of the driver's hatch shows the left M19 periscope head and guard and the hold-open catch. A bolt, the head of which is visible, passes through the upper part of each upright of the catch.

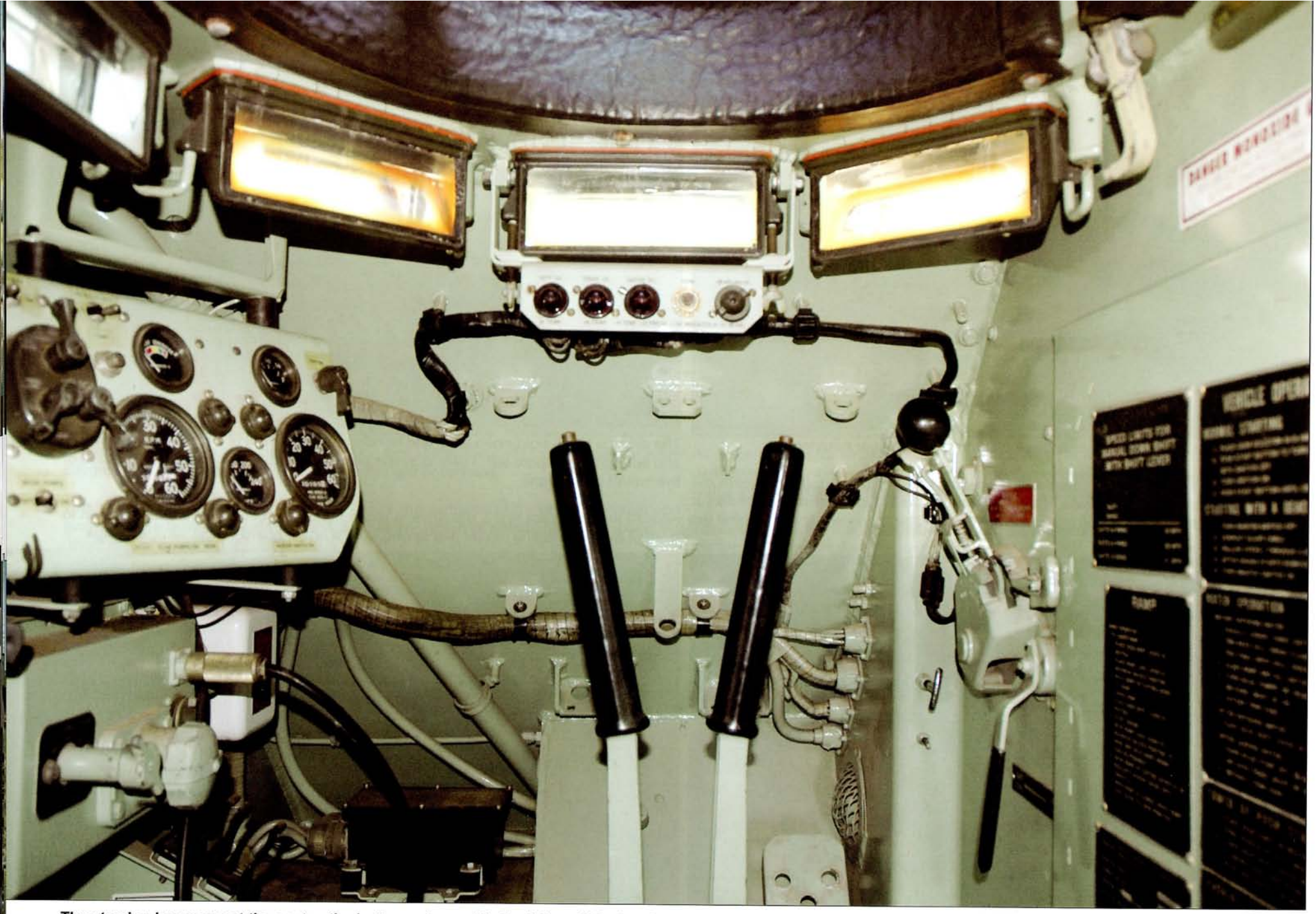
The bolt and nut of the hold-open catch are visible here. Note the part number cast on the top of the infrared periscope guard.

The hinge of the driver's hatch includes a cylindrical torsion bar housing.

The right-side radio antenna mount and guard are seen from overhead. Beneath the guard on the roof is the back side of the housing for the exterior actuating handle for the fixed fire extinguisher, which is located inside the vehicle on the left wall, behind the driver's seat.

The driver's hatch hold-open latch and handle appear in front of a radio antenna mount and spring to the upper left. There is a data plate on the side of the mount. Outboard of the mount is its guard.

Aboard the third pilot M113, the driver's hatch hold-open latch and handle are seen in front of a radio antenna mount and spring, with a brush guard on the vehicle's edge.



The steering levers are at the center, the instrument panel to the left, and the hatch and M17 periscopes to the top in this view, looking towards the front of the M113 driver's compartment. The handle hanging down next to the instructional plates at right is the ramp actuating lever. Immediately forward of the lever is the transmission range selector.

The inside of the driver's hatch and M19 infrared periscope mount are seen here from below. To the right is the interior locking latch of the hatch. Below the second periscope from the right is the warning light panel.

A round, black plastic knob is at the end of the ramp actuating lever handle and transmission range selector. The T-shaped handle in front of the range selector is the manual throttle control. Data plates at the right give instructions on speed limits, the operation of the ramp, power train maintenance, and general vehicular operation.

Below and left of the instrument panel is the master switch panel, with the master switch, auxiliary power receptacle, utility outlet, and infrared stowage receptacle (a dummy jack into which the infrared power cable is plugged when the M19 periscope is not in use). Left of the panel is the stored M19 infrared periscope and, to its left, a CVC helmet.

The ramp is locked closed when the handle next to the driver's hatch is in this position. To unlock the ramp, the latch is released and the handle is pulled down and back. To the upper left is the latch handle for locking the driver's hatch from the inside.

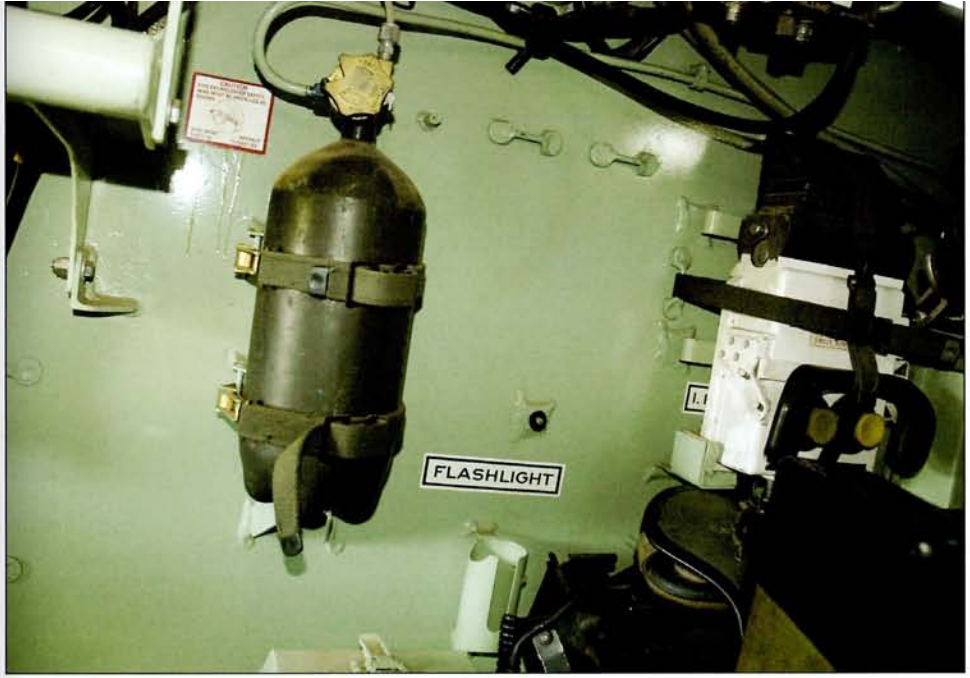
DANGER MONOXIDE GAS
DO NOT RELEASE RAMP LOCK HANDLE WHEN CABLE IS SLACK OR DISCONNECTED
RAMP LOCK LEVER
MUST BE UNLOCKED TO RAISE OR LOWER RAMP
LOCKED
UNLOCKED
VEHICLE OPERATION
NORMAL STARTING
POWER TRAIN MAINTENANCE
(VEHICLE MUST BE APPROXIMATELY LEVEL)

On and next to the ledge of the hull next to the driver are location labels for a 7.62mm rifle, ammunition boxes, and spare barrels. On the front of the hull to the left of the left steering lever is a small dimmer switch for the headlights. The accelerator pedal is partially hidden by the right steering lever.

The M113 and M113A1 had controlled differential steering, with levers used to steer, slow, and brake on land or water. Pulling back on the left lever steers the vehicle to the left; pulling back on the right lever steers it right. The turn radius decreases the harder the lever is pulled. Pulling back on both levers simultaneously brakes the vehicle.

A driving lights selector switch cluster (left), tachometer, battery generator and fuel level indicators, engine coolant temperature gauge, and speedometer (right) are on the instrument panel, beside switches for infrared power, bilge pumps, the starter and ignition (top right), and indicator lights for the bilge pumps and master switch along the bottom. Running diagonally behind the instrument panel is the bilge pump outlet line.

In Vietnam, many drivers reportedly preferred the backrest removed (as seen here from overhead) to facilitate quick exit from the driver's compartment if necessary. The seat is adjustable up/down, and forward/backward.



Strapped to the left wall behind the driver's compartment is the engine compartment's fixed fire extinguisher. Hoses run from it to the engine compartment, and actuating handles inside and outside the M113. An M19 infrared periscope is stored to the right.

In front of the roof brace behind the driver's hatch is his intercom control box. Spring-loaded retaining hooks on both sides of the periscopes hold them tightly in place.

At the bottom of the photo is the backrest for the front left personnel seat. A flashlight holder is located below and forward of the fixed fire extinguisher.

There is a dome light on the roof to the rear of the driver's intercom control box. It includes a white light, a smaller red light for blackout conditions, and a switch with a safety button to keep the white light from being accidentally turned on during blackout.

The M113A1 driver's compartment features the seat post (with the black rubber sleeve on top) on which the driver's seat is mounted. The lever below the seat with the round black knob controls the vertical positioning of the seat.

On the warning light panel below the periscope at the top of the photo are, left to right, a differential oil high temperature warning light, transmission oil high temperature light, engine oil high temperature/low pressure light, horn switch, and headlight high-beam indicator light.

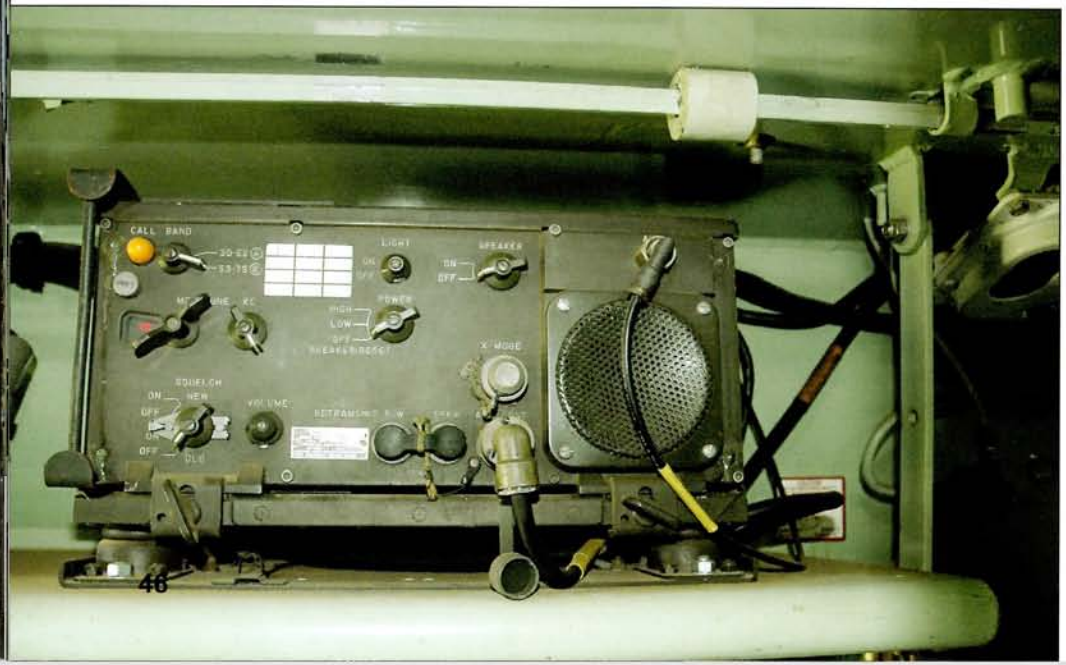
The M19 infrared periscope has been removed from its storage space to the rear of the instrument panel, and the driver's intercom box in this vehicle is in a different position, on the wall behind his seat. The master switch panel, below the instrument panel, is of the design installed in M113s after serial number F1254.

In the right foreground of this forward-looking view of the personnel compartment is the folded-up jump seat that faces to the rear and shares the same seat post as the commander's seat. To the front of that seat is the rear bulkhead of the engine compartment. The curved fixture to the top of the bulkhead is the personnel compartment outlet ventilator, with the commander's intercom control box mounted on the left of it. Above the personnel seat and backrest at left is the radio rack.

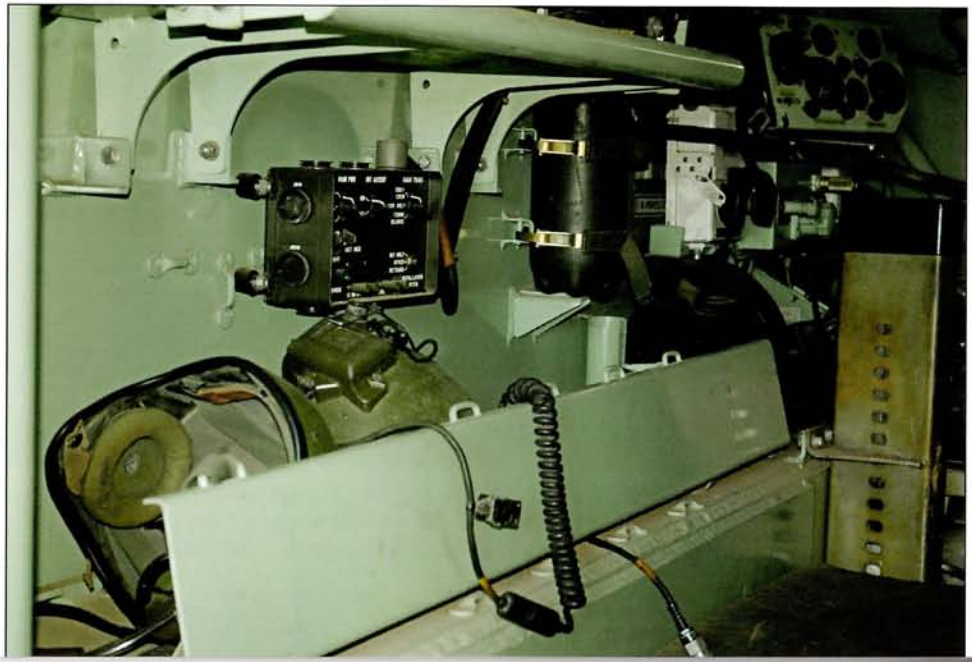
Mounted on the wall before the front left personnel seat is an intercom control box. The loops at the top of the backrest accept straps for holding the hinged personnel seat when stored in the upright position. Footman loops are liberally attached around the interior for securing gear. The rear of the driver's seat post is to the right.

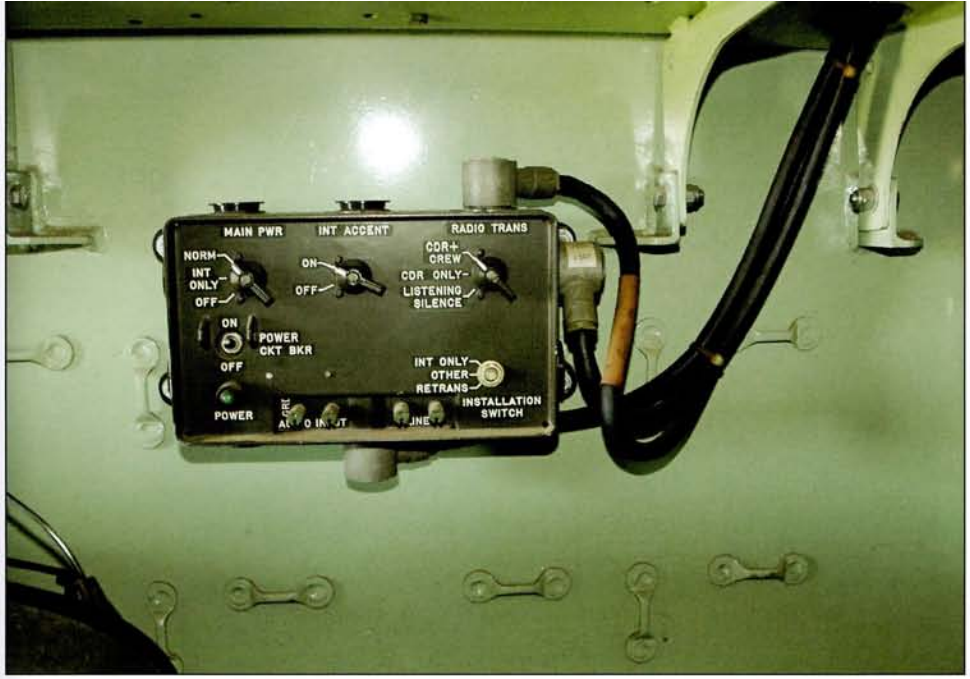
A rack on the left wall of the personnel compartment holds radio equipment. Below it is a radio control box. To the upper right is a dome light. The rod and linkage on the ceiling is part of the ramp locking system.

An RT-524/VRC FM receiver-transmitter is mounted on the rack. This unit is the major component of the AN/VRC-12 radio set. The mount has cushions to buffer the radio from vehicular jarring. To the right of the unit is a built-in loudspeaker.

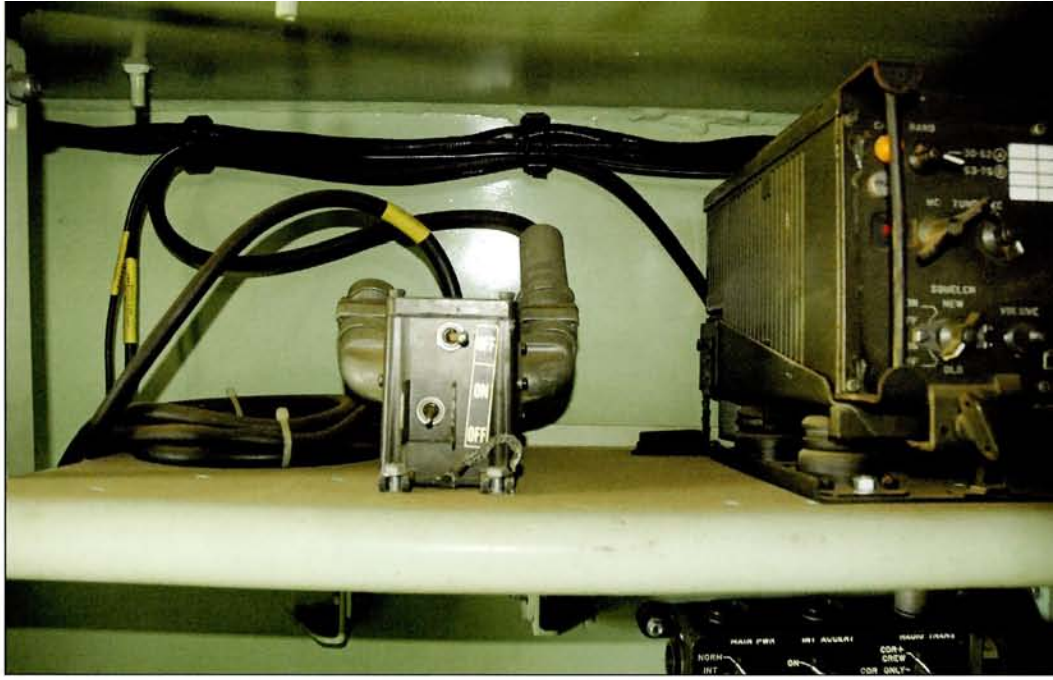


Behind the backrest of the personnel seat are two Vietnam-era non-ballistic CVC helmets that protected against vehicular bumps and concussion, and had built-in earphones and microphones. Visible in the closer helmet are the suspension and cushioned, snap-on earphones. On the other helmet are a send-receive switch box and microphone boom.



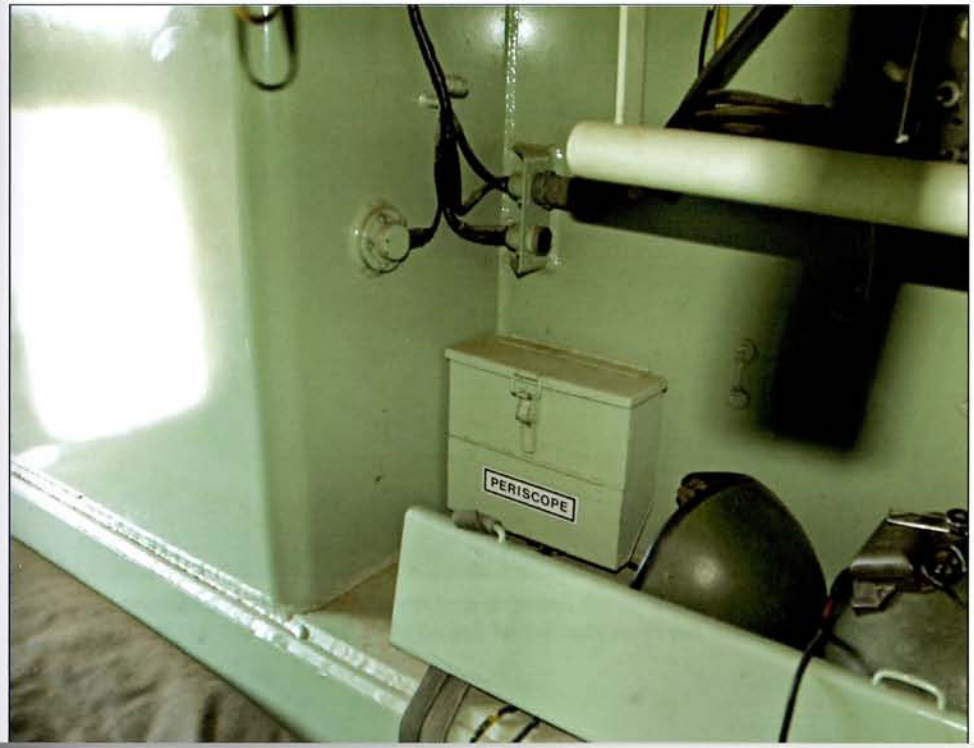


On the wall under the receiver-transmitter rack is the AM-1780 amplifier that is the main control box for the intercom system, amplifying intercom and received radio signals.

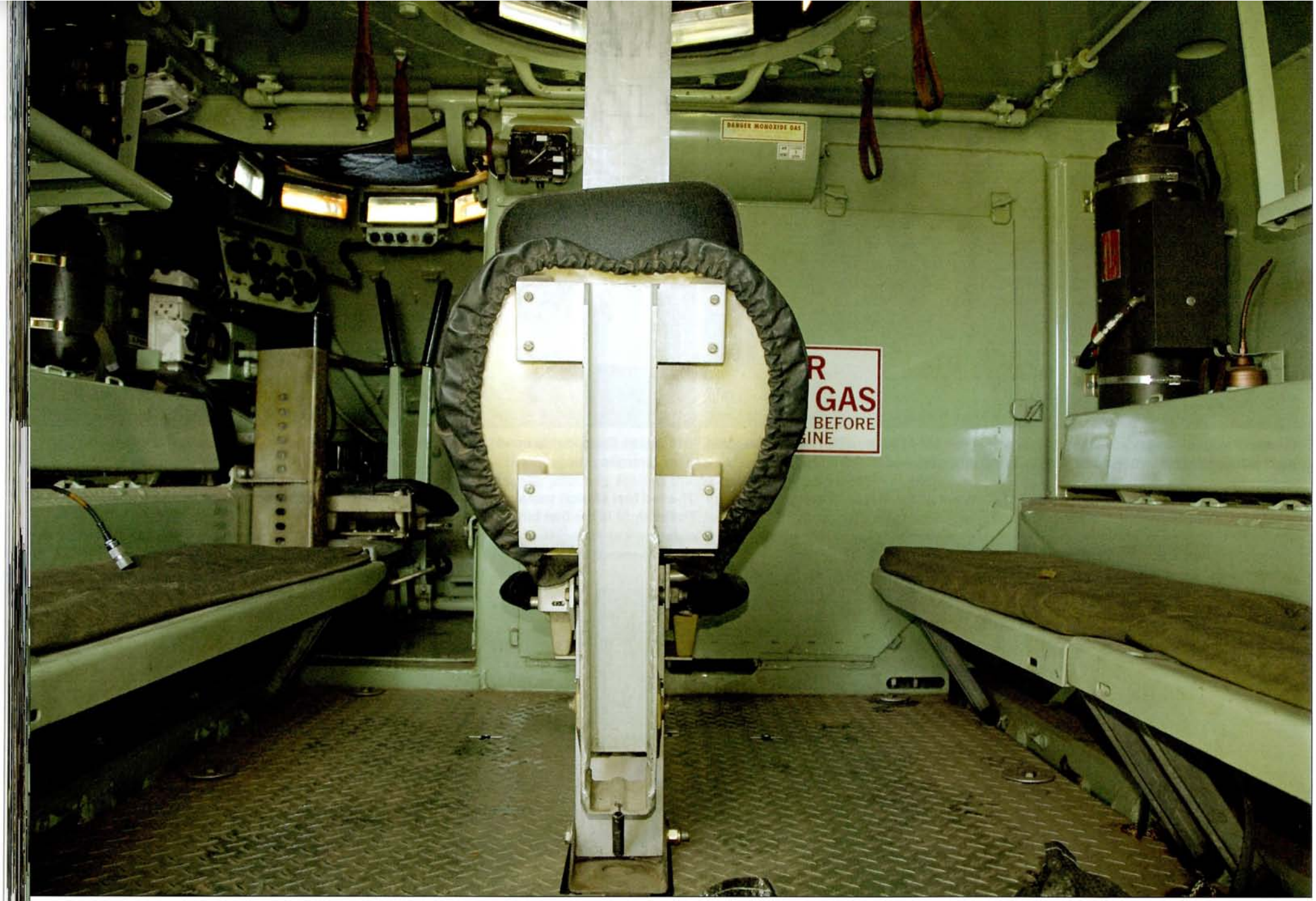


The 'Battle Override' is used to shut off the power to all the communications equipment when cranking the vehicle.

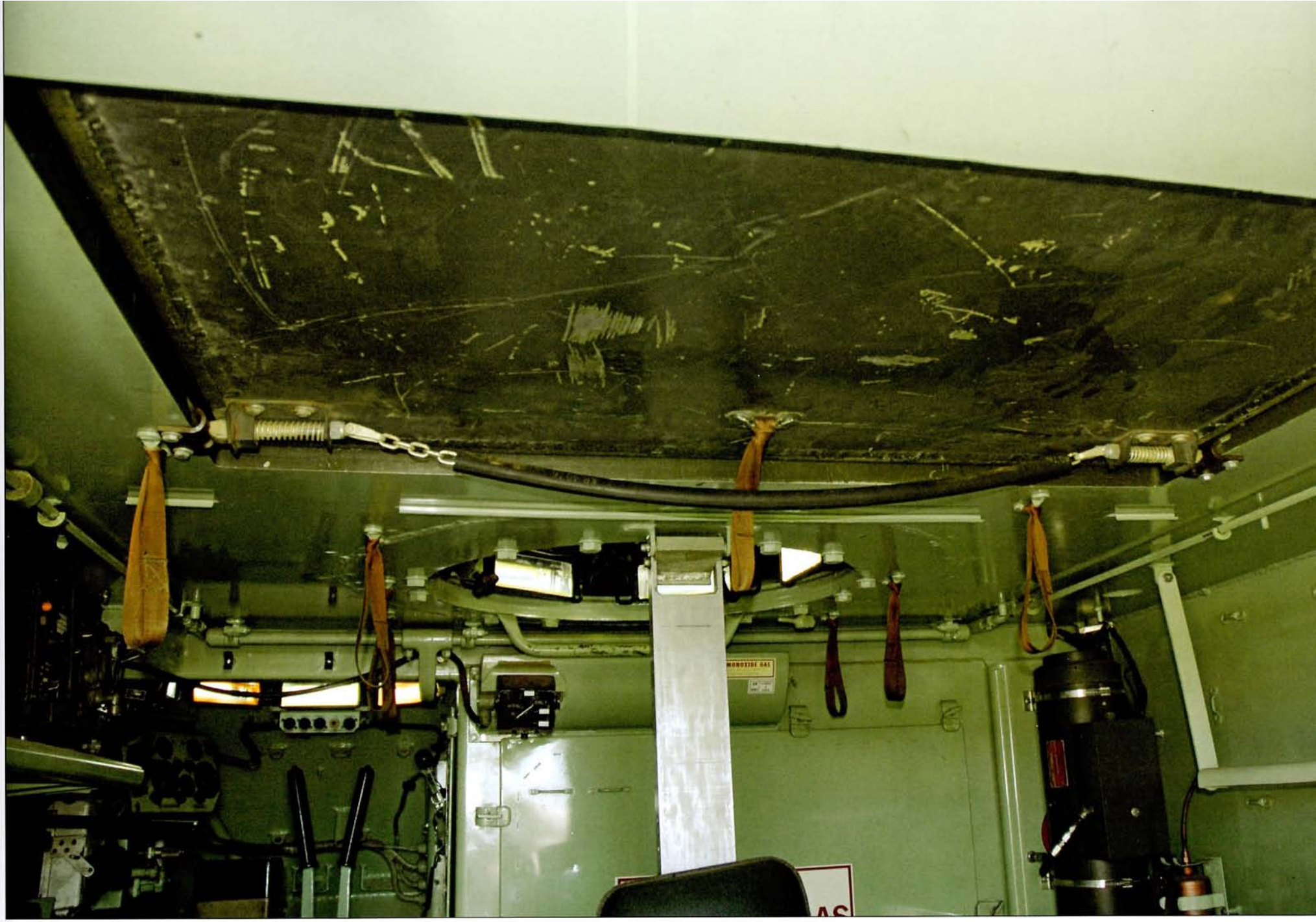
An 80-gallon fuel tank is located in the left rear corner of the M113. A periscope storage box is to the front of it.



The red fuel shutoff valve at the left rear corner of an M113 is adjacent to the ramp door. To the right is the fuel tank.



A folding jump seat is mounted to face the rear on the same seat post shared by the commander's seat. To the right is the personnel compartment heater, a combustion type supplied by fuel from the vehicle's fuel tank. There is a copper-colored oil can next to the heater. Also visible are the right personnel seats.



The interior of the cargo hatch is seen here inside the personnel compartment. The M113 and M113A1 hatch is a one-piece unit. Pulling down on the hose-covered chain releases the bolts on either side of the hatch, permitting it to be opened. Grab straps are attached to the ceiling.

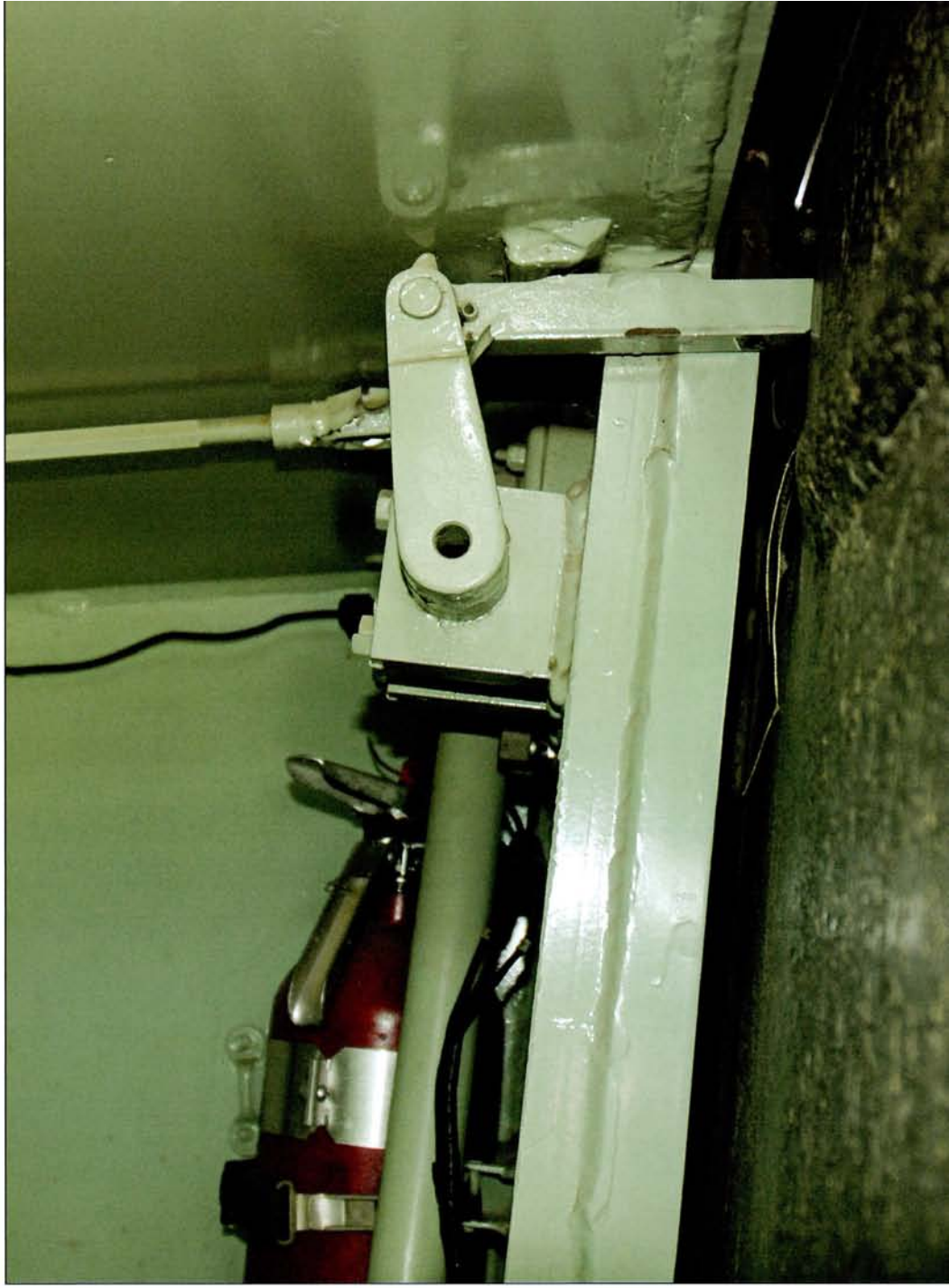
The ramp locking mechanism is at the upper left rear corner of the personnel compartment on the third pilot M113. The rod running along the corner of the ceiling and the fuel tank links the ramp lock to the ramp lock lever in the driver's compartment.

In the center of the ceiling near the rear of the M113's personnel compartment is the air inlet ventilator. Pushing up on the knob at the center allows outside air into the personnel compartment, and pulling it down closes the ventilator.

The battery box at the right rear of the M113's personnel compartment holds two 12-volt batteries wired in series. The latches are open and the lid is partially raised. The pipe going to the roof is the rear bilge pump outlet line.

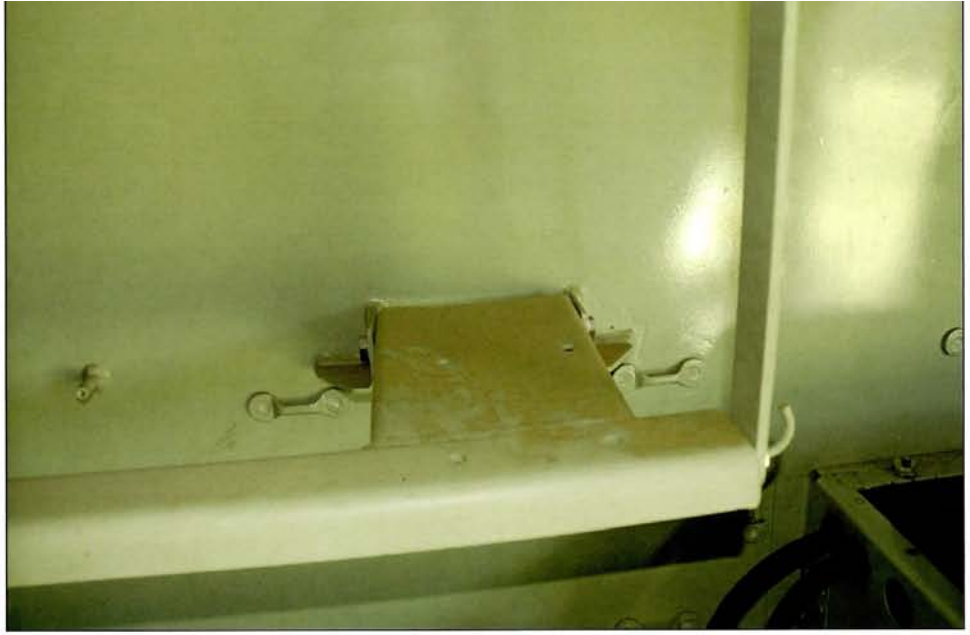
The data plate on the lid of the battery box, seen here from the left rear personnel seat, gives instructions on servicing the batteries. There is a dome light on the ceiling above the battery box, and to the left is a storage rack.

The linkage rod of the ramp lock system runs across the ceiling. To the left of the ramp lock is a covered AC receptacle. Below it are the four external-telepost terminals.



The rough, non-skid surface of the ramp is visible in this side view of the ramp and the right ramp lock.

An oil can is stored on the right side of the personnel compartment. At the center is a storage rack, and below it is the seat back. At the far right is the battery box, with its cover removed, exposing the heavy rubber insulation.



This bottom cross member of the storage rack is on the right side of the personnel compartment.

At the front right corner of the personnel compartment is the personnel heater, secured in place by two clamping-type bands. The exhaust is visible above the unit. The round hole in the ceiling is for access to the base of the forward right antenna mount. Also on the ceiling is part of the linkage of the right ramp lock. To the upper left is the right side of the personnel compartment outlet ventilator.

The circular opening slightly forward of the dome light on the right side of the crew compartment ceiling allows access to the right rear antenna mount. (On this vehicle, the third pilot M113, machine gun mounts have been placed on the two rear antenna mounts; thus, there is no wiring for an antenna.)

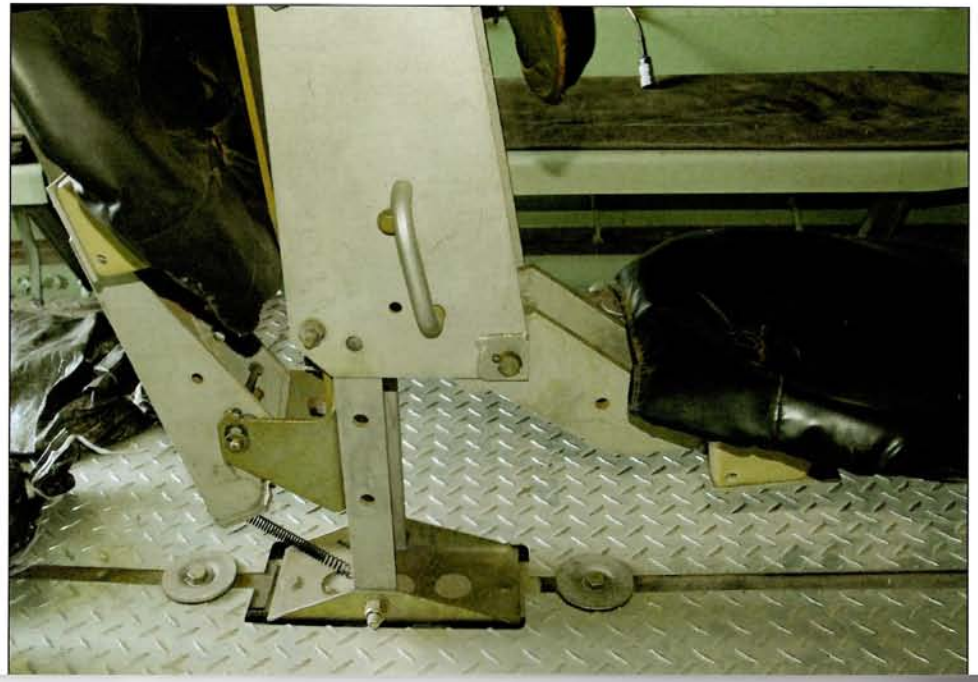
This overall view shows the outlet ventilator and commander's intercom box. Part of the interior of the cupola is visible at the top, including an M17 periscope. A decal warns of the dangerous of operating the vehicle with the interior engine covers removed.

The commander's hatch is provided with an interior latch; the latch handle is fastened to the cupola and is shown here engaged to the strike, bolted to the hatch. The crash pad surrounding the hatch opening is visible, as well as some of the spring-loaded hooks that hold the M17 periscopes in place.

The commander's seat has been adjusted low on the seat post; the jump seat is to the rear of it. The L-shaped handle controls the vertical placement of the seat. The commander's platform, a fixture with adjustable legs, mounted with a quick-release latch to the seat post below the seat, has been removed.

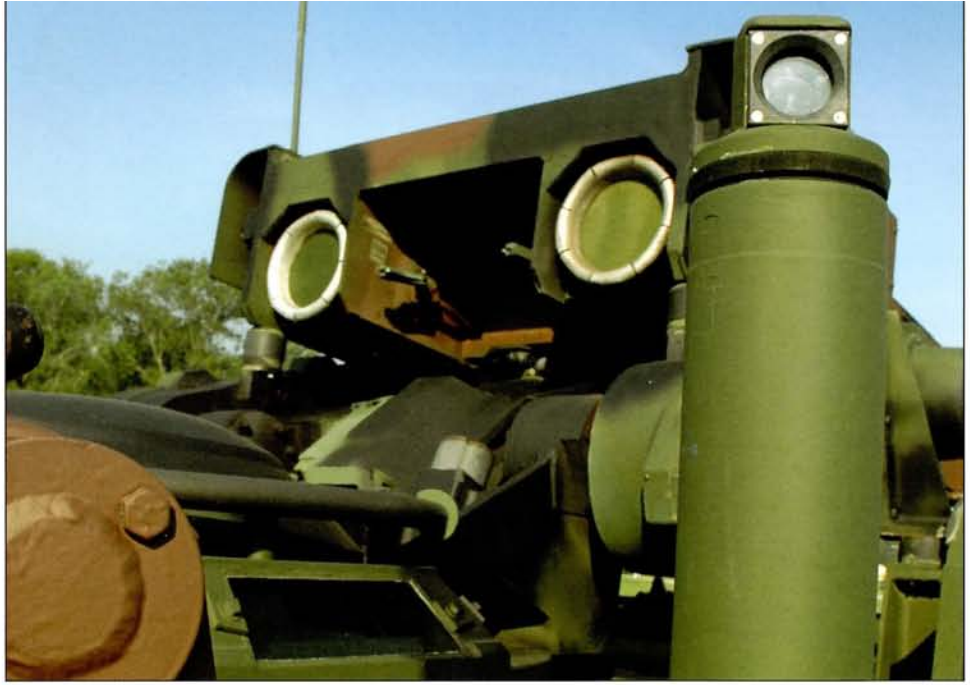
The vertical control handle engages a spring-loaded pin that engages the holes in the seat post. The seat is adjusted vertically by pulling the handle toward the post and manually lifting or lowering the seat, releasing the handle to lock the seat at the desired position.

The bottom of the seat post is seen here from the right side, with the folded jump seat to the left and commander's seat to the right. The jump seat is fixed-height, unlike the commander's seat. The floor plates have a diamond tread pattern and are removable. They are held in place by screws and washers, as shown here.



The M901 improved TOW (tube-launched, optically-tracked, wire-guided) vehicle (ITV) was an M113A1 or M113A2 armored personnel carrier with two TOW antitank missile launchers and sighting equipment in an armored, articulated mount above the location of the commander's cupola. This arrangement permits firing the missiles with the vehicle in defilade. The launcher, nicknamed the Hammerhead and designed and manufactured by Emerson Electric Company, is shown raised, ready for firing, in this photo taken during Exercise REFORGER '85. Vehicles equipped with launch systems for TOW2 and TOW2A missiles were redesignated the M901A1.

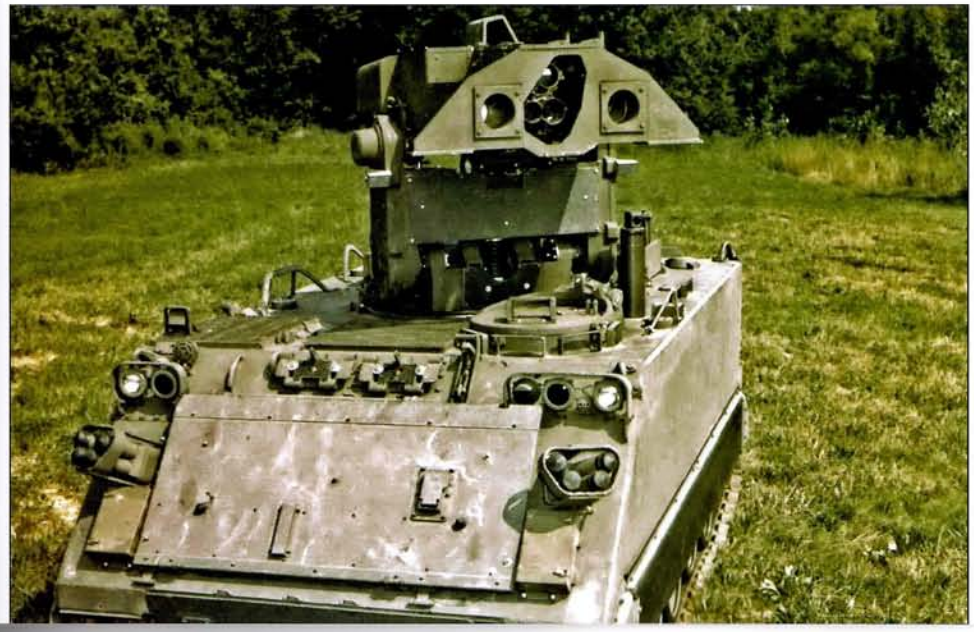
As seen on this restored vehicle, the M901's TOW mount was lowered to the rear, to rest on supports attached to the roof, when not in use. Other features particular to the M901 are the squad leader's periscope to the rear of the driver's hatch, an M26 periscope on the roof below the front face of the launcher, and the an array of British-designed M239 smoke grenade launchers on the glacis below the headlights.



The squad commander's panoramic periscope on the M901 allowed him to view a 270-degree span of terrain around the vehicle when the targeting head was lowered. A modified M27 cupola supports the launcher arm.

The targeting head of the M901 was rotated to the rear and lowered onto supports when not in use. Thus, the rears of the launchers face to the front when the unit is stored. The external handle for the fixed fire extinguisher system is visible in the housing below the inverted-V-shaped guard at the center of the photo.

This M901 is equipped with the smoke grenade launchers on either side of the glacis, with smoke grenade storage boxes below the launchers. Spare track shoes were stored above the trim vane in the location formerly occupied by a shovel. At the center front of the targeting head (the unit containing the TOW launchers and optics) are the night sight (upper) and the day sight and tracker (lower). (TACOM LCMC History Office)



A view of the left side of the M901 launcher, with one of its two lifting arms resting on a front support. The launcher's elevation and traversing functions were powered by a combination of hydraulic and electrical systems. The front and rear supports of the launcher are visible on the far side of the roof.

When stowed, the front of the targeting head faces towards the rear of the vehicle and rests on two rear supports. The protrusion at the top of the targeting head houses a 3x scope, which the gunner uses to acquire the target before switching to the 13x daytime tracker for firing the TOW missile.

On either side of the loader's hatch to the rear of the turret are hinged armored shields, to give the loader additional protection when standing up through the hatch to reload the TOW tubes. The left shield is shown in its folded-down position. There is a grab handle at the center. The paint on this vehicle is peeling badly.

A vision block is in the ramp door of the M901. Two vertical metal strips are bolted over the face of it. The telepost is the small box between the ramp and right tail light.

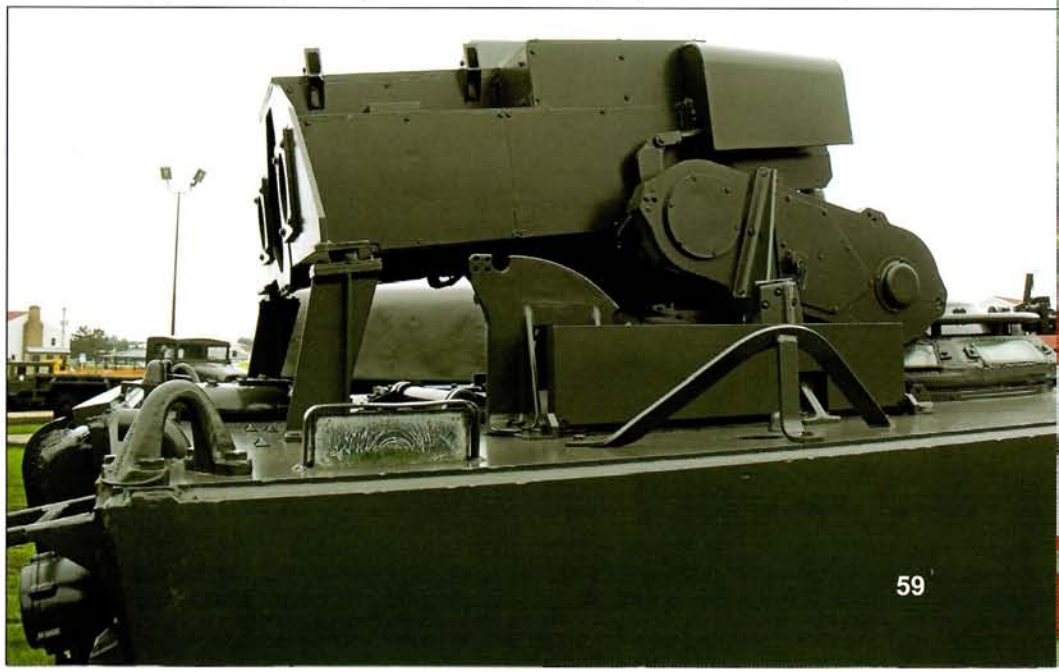
In this view of the raised launcher head the details of the underside as well as the support can be seen. At far left is the radio antenna.

This immaculate M901A1 is owned and restored by Paul Baillargeon. The M901 had two guards for antenna mounts on either side of the vehicle. One such mount is visible here to the right of the loader's hatch.

The folded-down right shield for the loader is visible toward the lower right in this view of the stored tracking head. The curved pipe at the bottom center of the photo is the rear bilge pump outlet pipe.

An overall view of the right side of an M901 TOW launcher vehicle with the trim vane extended. Protruding around the turret is a track mount for a 7.62mm M60 machine gun. The track shroud (or sand shield) is vertically shortened and, at both ends, shroud cover bottoms have been cut off.

On the edge of this M901, below the business end of a stored TOW launcher, are a lifting and an M26 periscope. The fixture shaped like a quarter-circle inboard of the raised loader's shield is a hold-open bracket for the loader's hatch, with detentions to hold the hatch at an approximately 45-degree or 90-degree angle. (John Adams-Graf)



The lifting arm on the left side of the launcher appears here with the launcher rotated forward. In the foreground are the antenna mount guard and driver's hatch, and at right the commander's panoramic periscope.

As viewed from the front right of the M901, the track mount for an M60 machine gun is below the hatch and above the vision blocks in the turret. The personnel heater exhaust is the pipe elbow near the edge of the roof in the foreground.

The guards for the M239 smoke grenade launchers are apparent on both sides of the glacis on this M901. (John Adams-Graf)

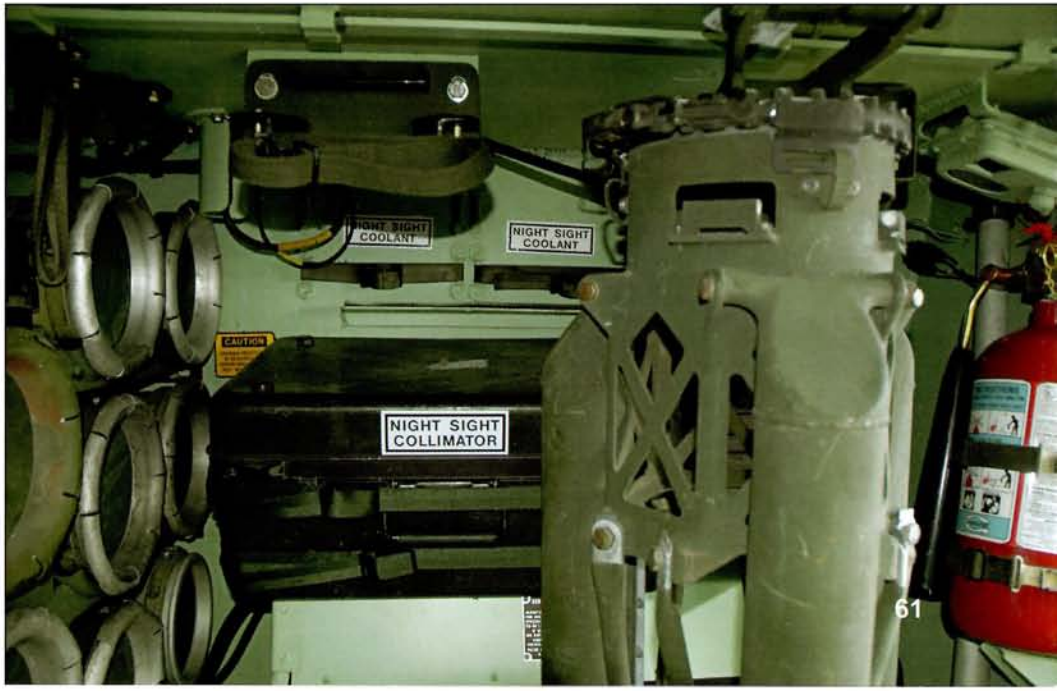
The plywood trim vane on this M901 was suffering from moisture infiltration: hence, the wood grain is showing prominently over most of the surface. (John Adams-Graf)

The trim vane has been extended, showing original paint and stencilings but also widespread rotting and delamination of the plywood. The extension (or brace) attaches to the latching fixture inset into the trim vane.

The four tubes of the M239 smoke grenade launcher have been installed. Each is fitted with a black protective cap. Note the service and infrared headlights, with the horn just above them. The head of the shovel is visible just above the top of the trim vane.

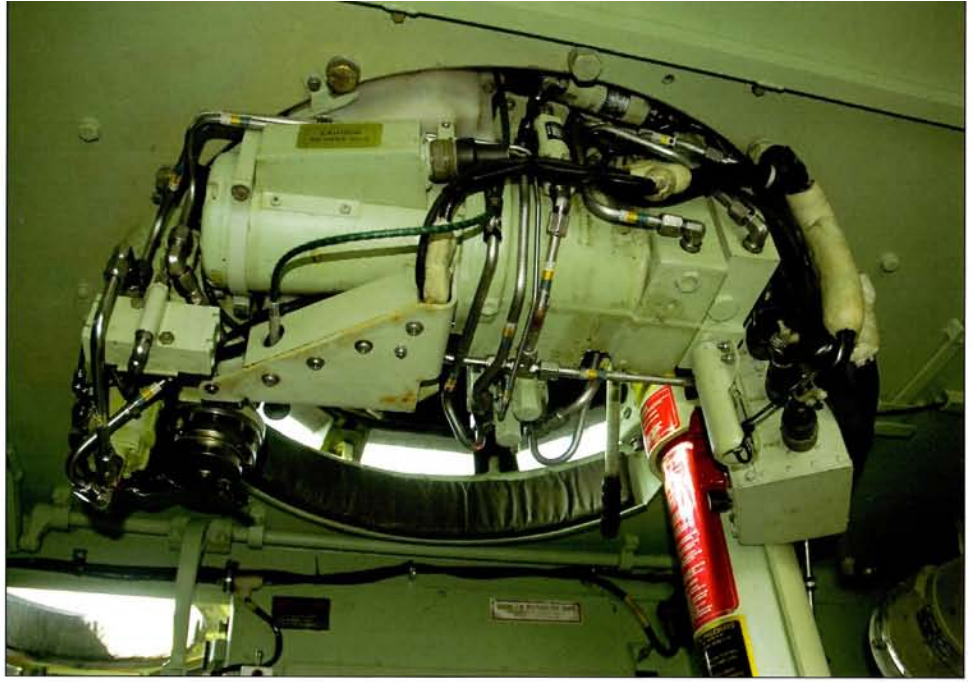
The M901 carried 10 TOW missiles stowed on the right side of the interior of the vehicle, in addition to two loaded in the launcher. To the left are the gunner's seat and controls. A box-shaped emergency weapon power battery is on the floor panels.

If necessary, the missiles could also be fired from the ground outside of the vehicle by using a tripod mount. The tripod mount is shown in the right foreground of this photo. To the right is a portable fire extinguisher for use by the vehicle's crew.



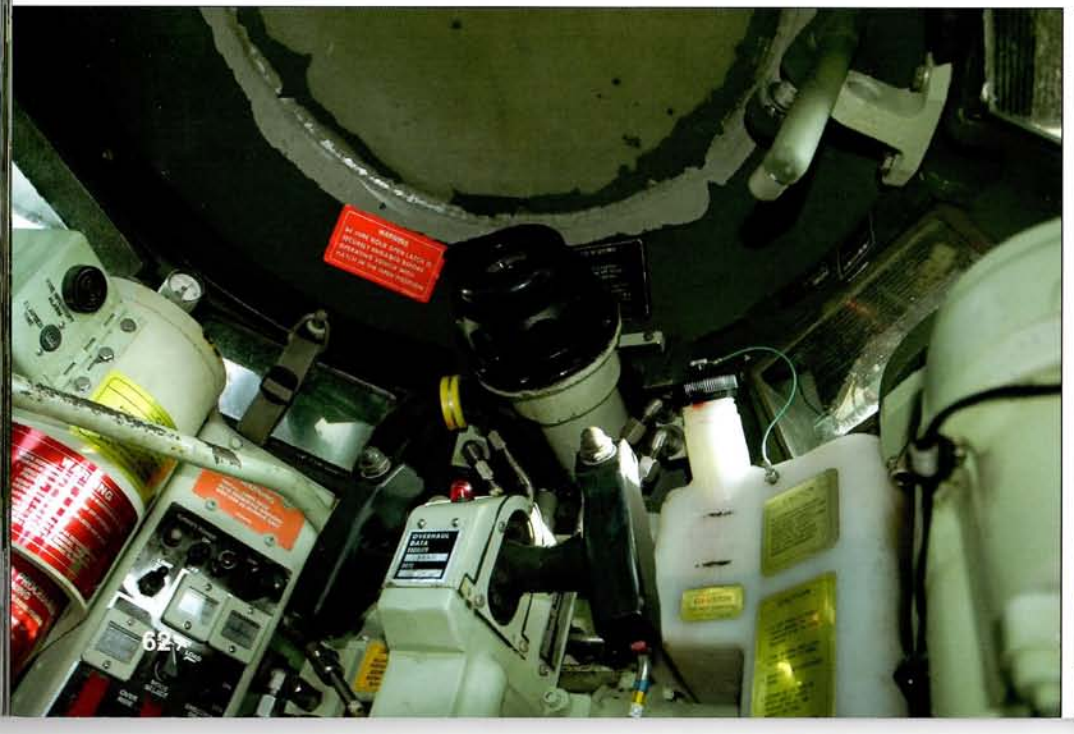
The base of the rotating weapons operator's station is located near the center of the vehicle's fighting compartment. In the distance on the left of this photo is the driver's position.

The gunner's controls and optics are mounted above his seat in the turret that supports the launch mechanism.

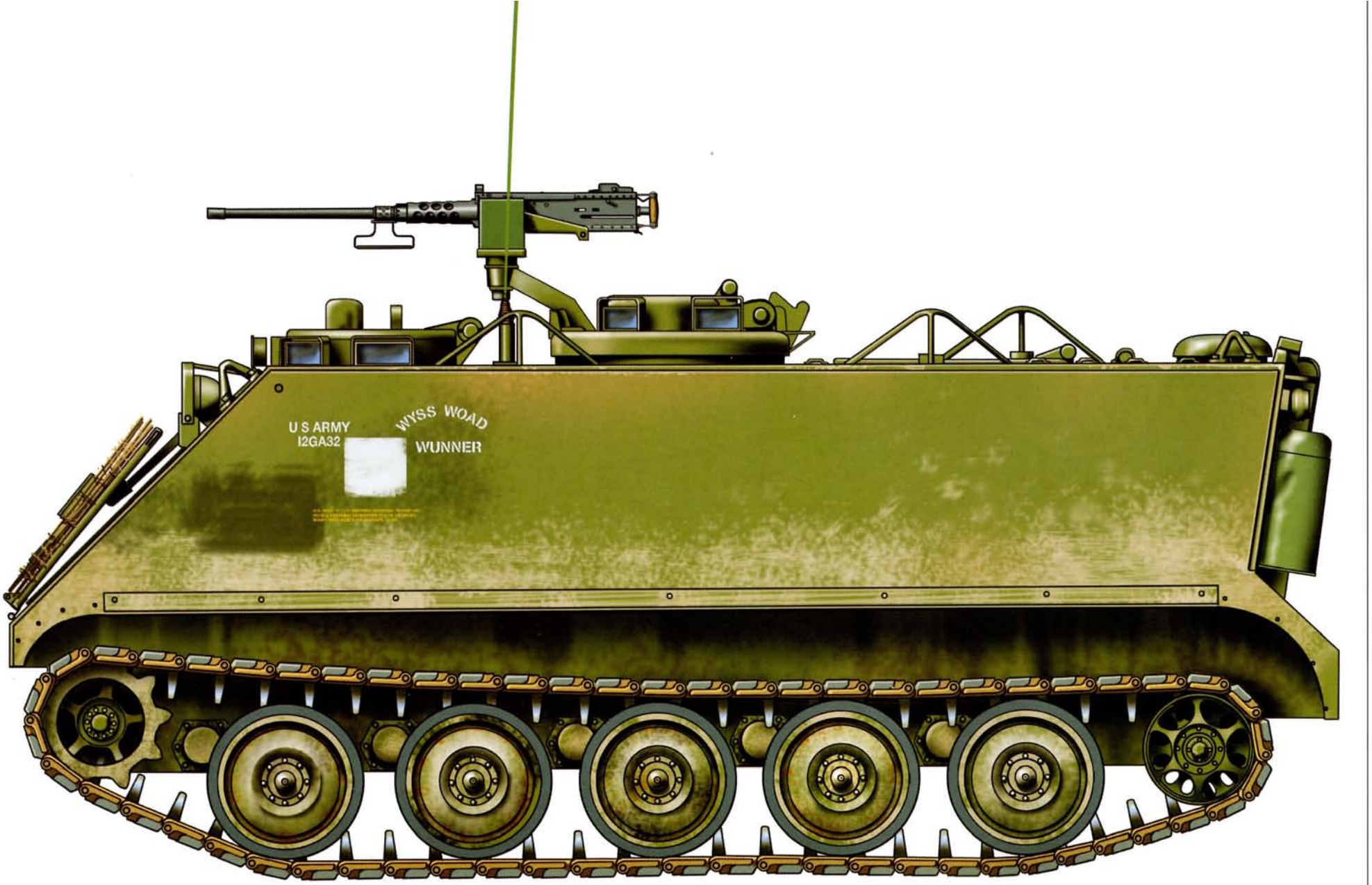


The complex control and operating system for the TOW launcher is seen here from below. The turret launcher provides for movement of 360° in azimuth and +35° to -30° in elevation.

The M901A1 is powered by this Detroit Diesel 6V53 6-cylinder Vee-type diesel engine, developing 212 horsepower.



An ACAV from the 9th Division crosses a creek outside of Fire Support Base Bastogne *en route* to joining a convoy on16 April 1968. Only one "star" and registration number (white) was visible, and that was on the back ramp. The vehicle base color was semigloss OD FS595A 24087 with white letters for the "nose art."



Semigloss olive drab FS595A 24087 was the base color for all M113 carriers shipped to Vietnam, including this 2nd Battalion, 47 Infantry (Mechanized) 1st Brigade, 9th Infantry Division vehicle participating in "Operation Santa Fe" in November 1967. The barbed wire and poles stowed on the front of the vehicle were used to encircle the vehicle at night. This vehicle has only the commander's .50 machine gun with no shields. This uncovered arrangement resulted in many casualties among vehicle commanders and was found to be inadequate in the context of Vietnam, especially after lessons learned at Ap Bau Bac when many ARVN TC/gunners were killed, in part for lack of cover.

The four-color Mobility Equipment Research & Development Command (MERDC) camouflage scheme was introduced in 1975, and was used by the US army until the mid-1980s, when it was replaced by the three-color NATO scheme. The MERDC scheme was worn by this 1st Cavalry Division M113A2 as it passed through the town of Wells after crossing the Maas River during REFORGER/AUTUMN FORGE '83. The rubber skirts above the tracks were not painted. The APC is equipped with an M2 HB .50 cal. machine gun.

MERDC Color Distribution FS595A

Winter U.S. & Europe - verdant

1	Forest Green 34079	45%
2	Field Drab 30118	45%
3	Sand 30277	5%
4	Black 37038	5%

Snow - temperate with trees & shrubs

1	Forest Green 34079	45%
2	White 37875	45%
3	Sand 30277	5%
4	Black 37038	5%

Snow - temperate with open terrain

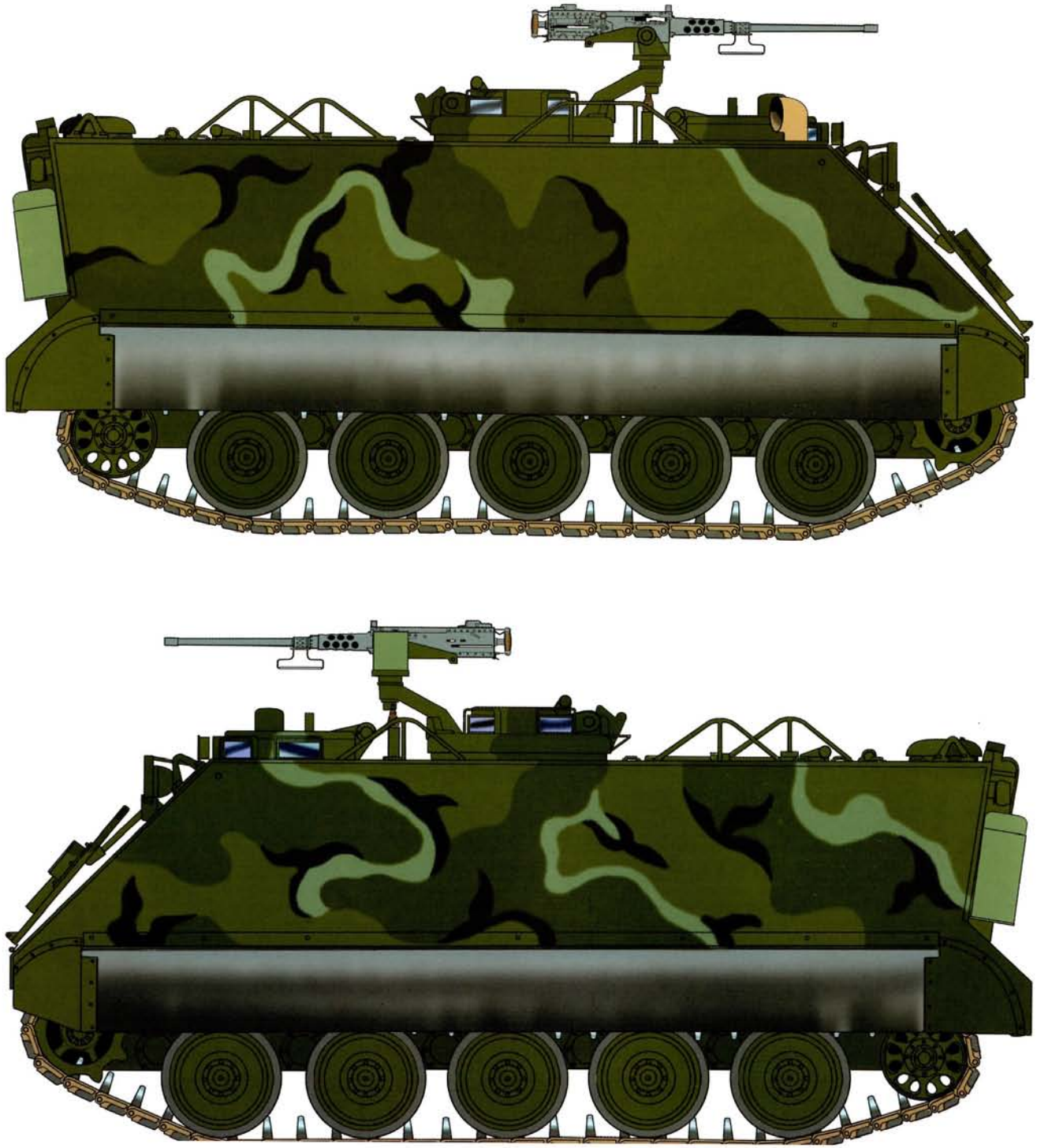
1	White 37875	45%
2	Field Drab 30118	45%
3	Sand 30277	5%
4	Black 37038	5%

Summer U.S. & Europe - verdant

1	Forest Green 34079	45%
2	Light Green 34151	45%
3	Sand 30277	5%
4	Black 37038	5%

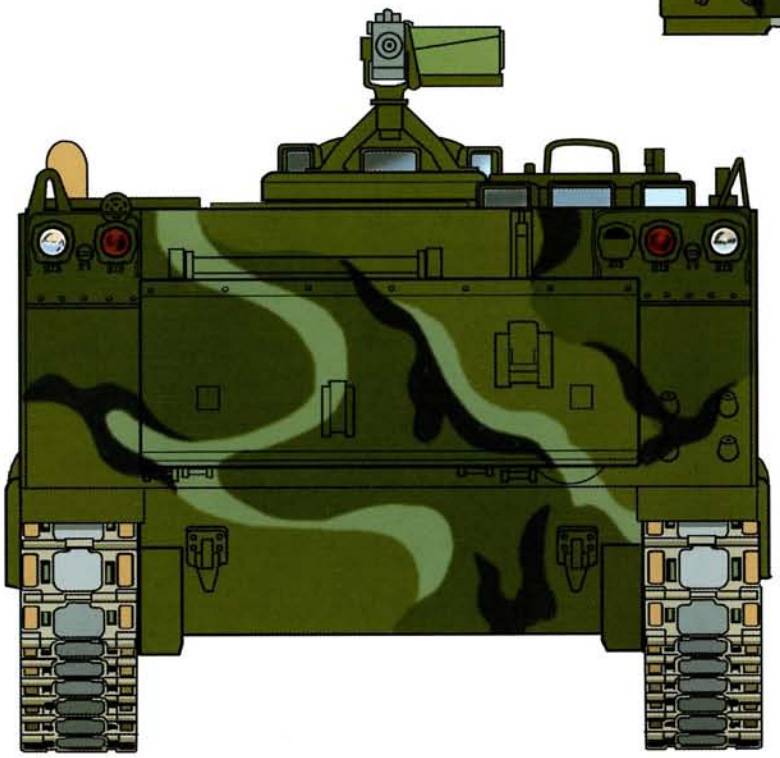
Summer U.S. & Europe - verdant

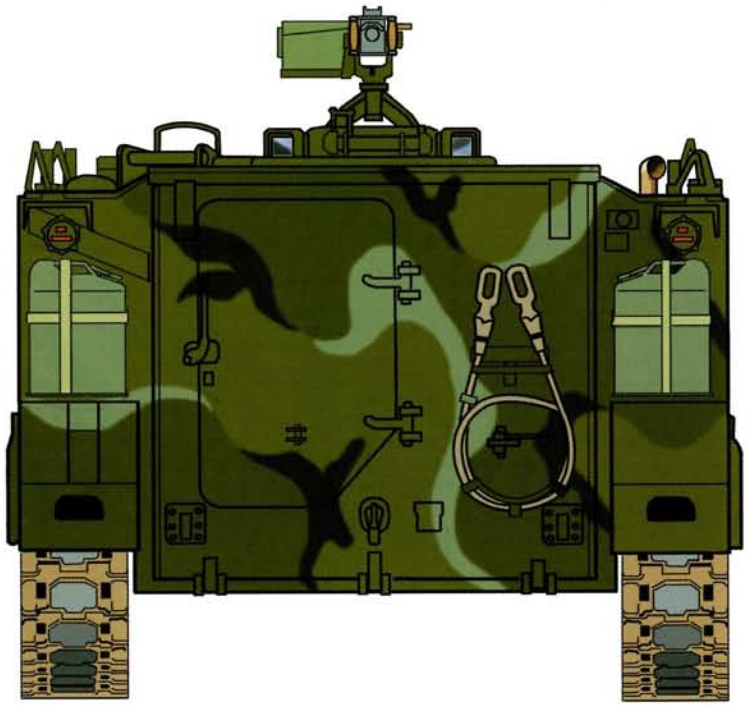
1	Forest Green 34079	45%
2	Light Green 34151	45%
3	Sand 30277	5%
4	Black 37038	5%



Tropics - Verdant

Forest Green 34079	45%
Dark Green 34102	45%
Light Green 34151	5%
Black 37038	5%





MERDC Color Distribution FS595A

Tropics - verdant

1	Forest Green 34079	45%
2	Dark Green 34102	45%
3	Light Green 34151	5%
4	Black 37038	5%

Gray desert

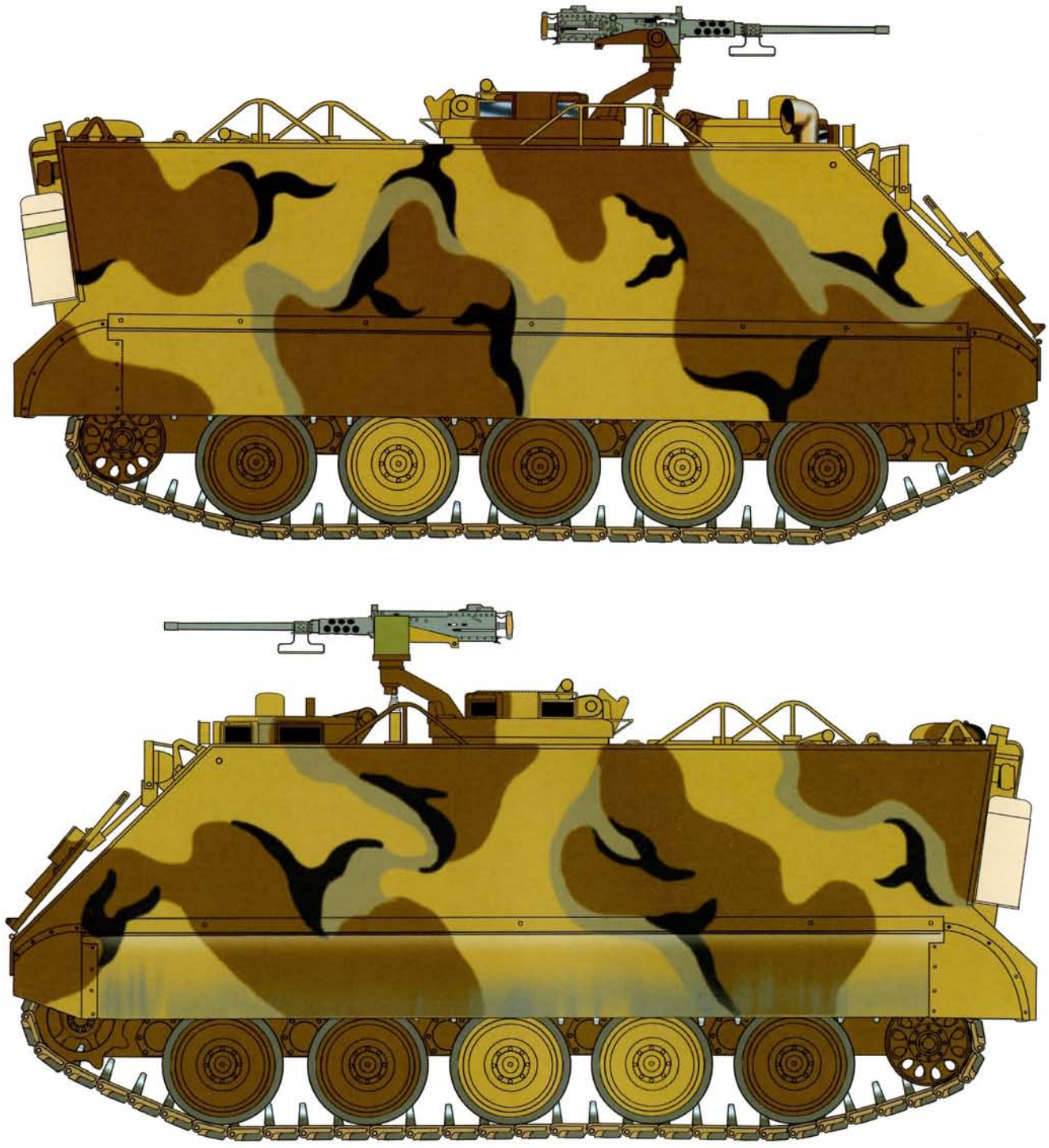
1	Sand 300277	45%
2	Field Drab 30118	45%
3	Earth Yellow 30257	5%
4	Black 37038	5%

Red desert

1	Earth Red 30117	45%
2	Earth Yellow 30257	45%
3	Sand 30277	5%
4	Black 37038	5%

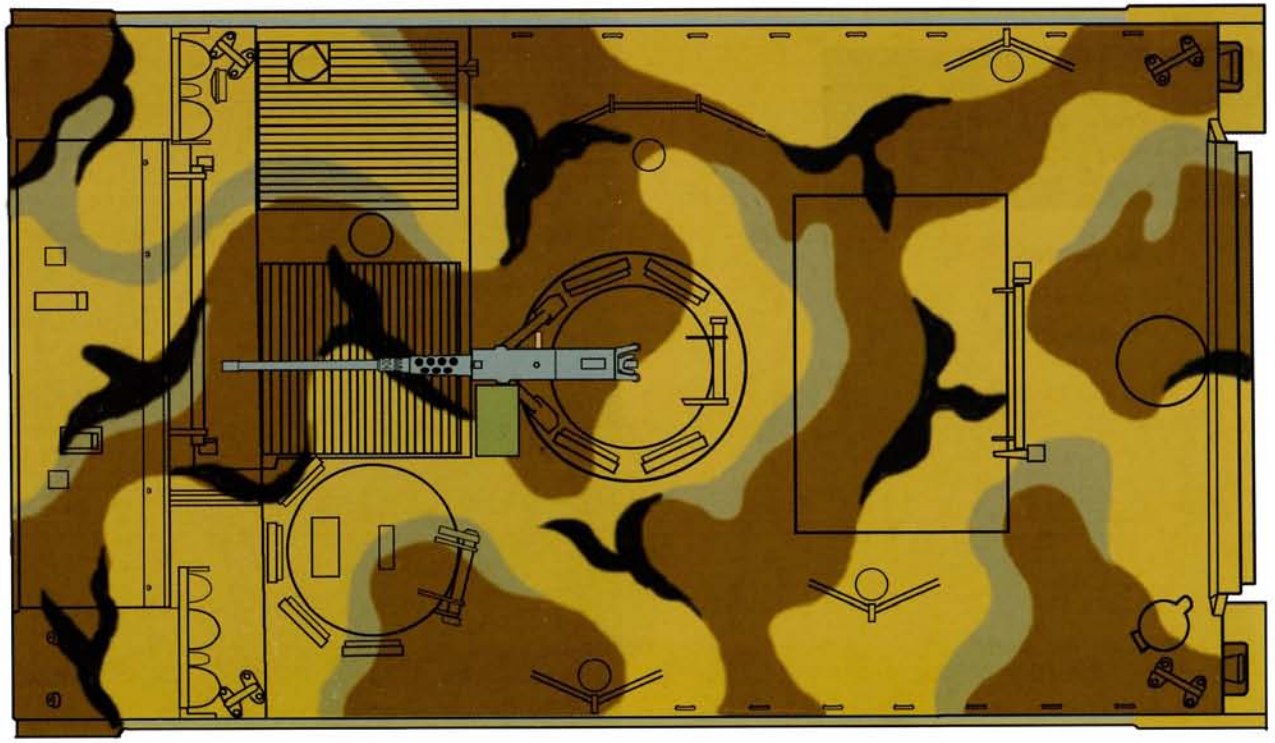
Winter Arctic

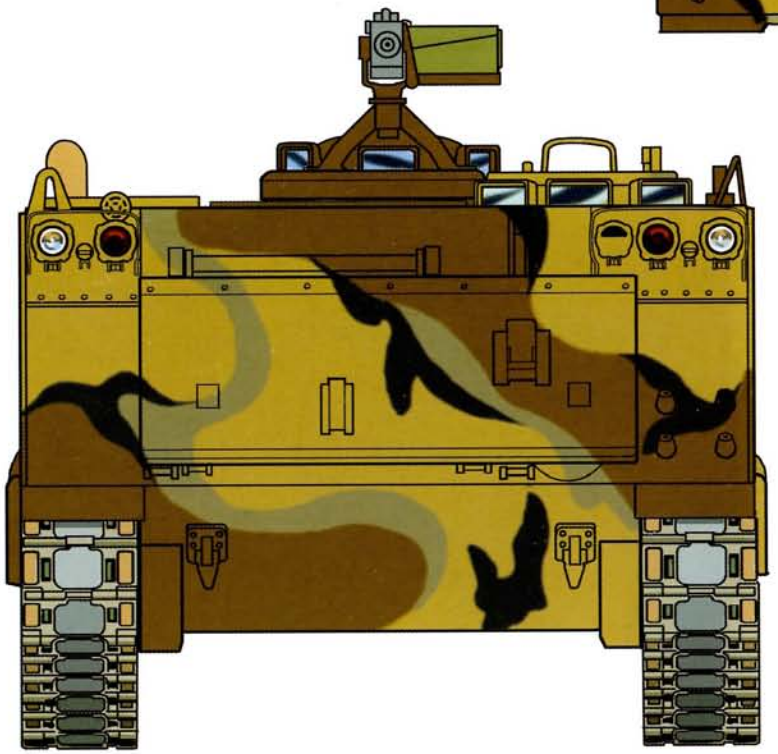
1	White 37875	45%
2	White 37875	45%
3	White 37875	5%
4	White 37875	5%

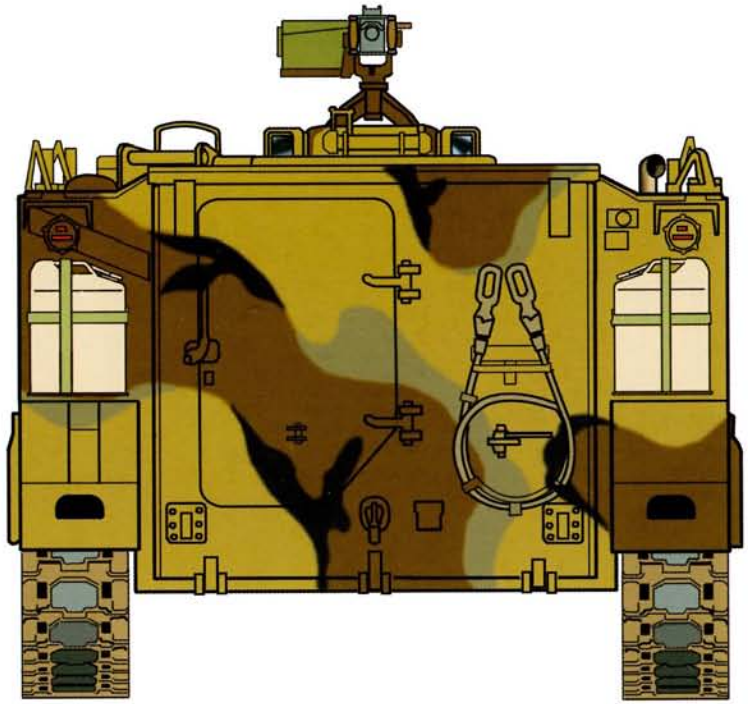


Red Desert

Earth Red 30117	45%
Earth Yellow 30257	45%
Sand 30277	5%
Black 37038	5%

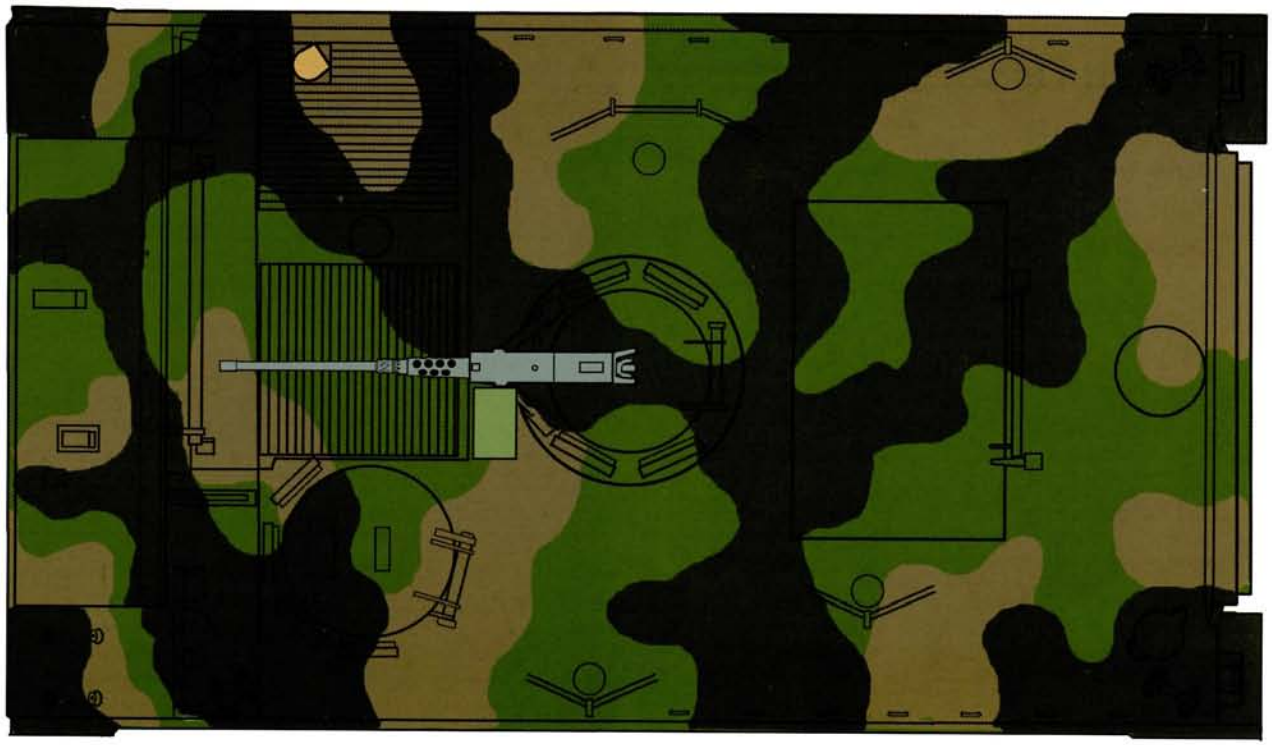


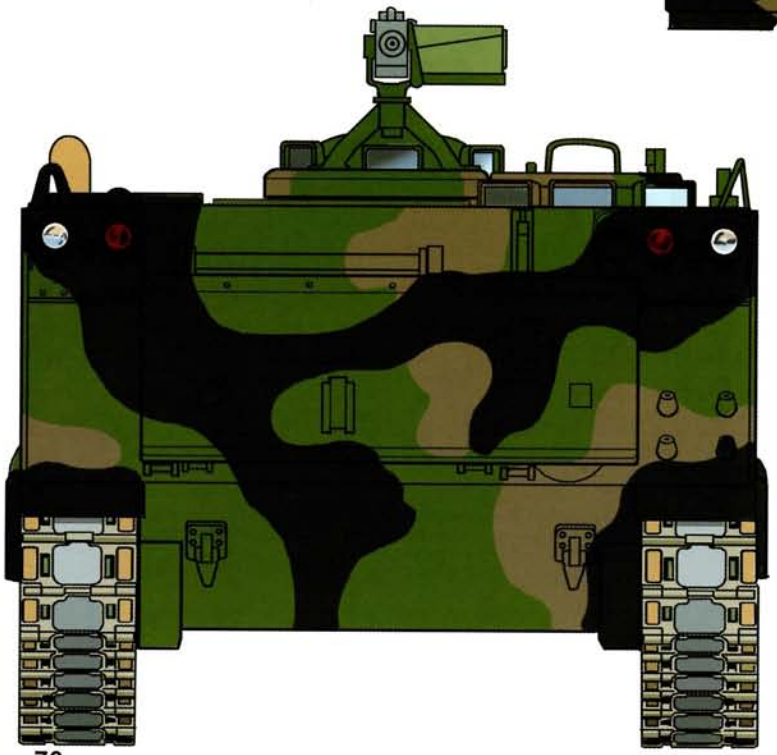


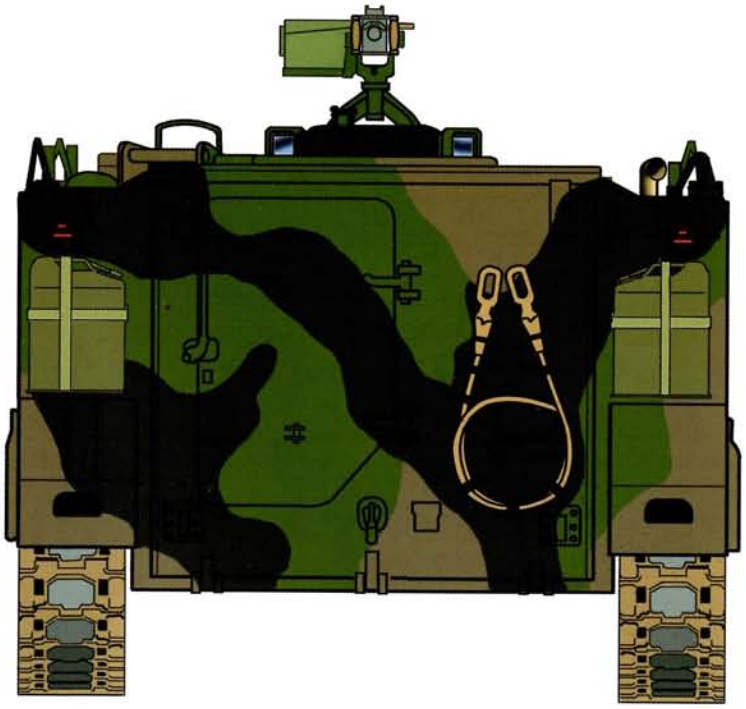


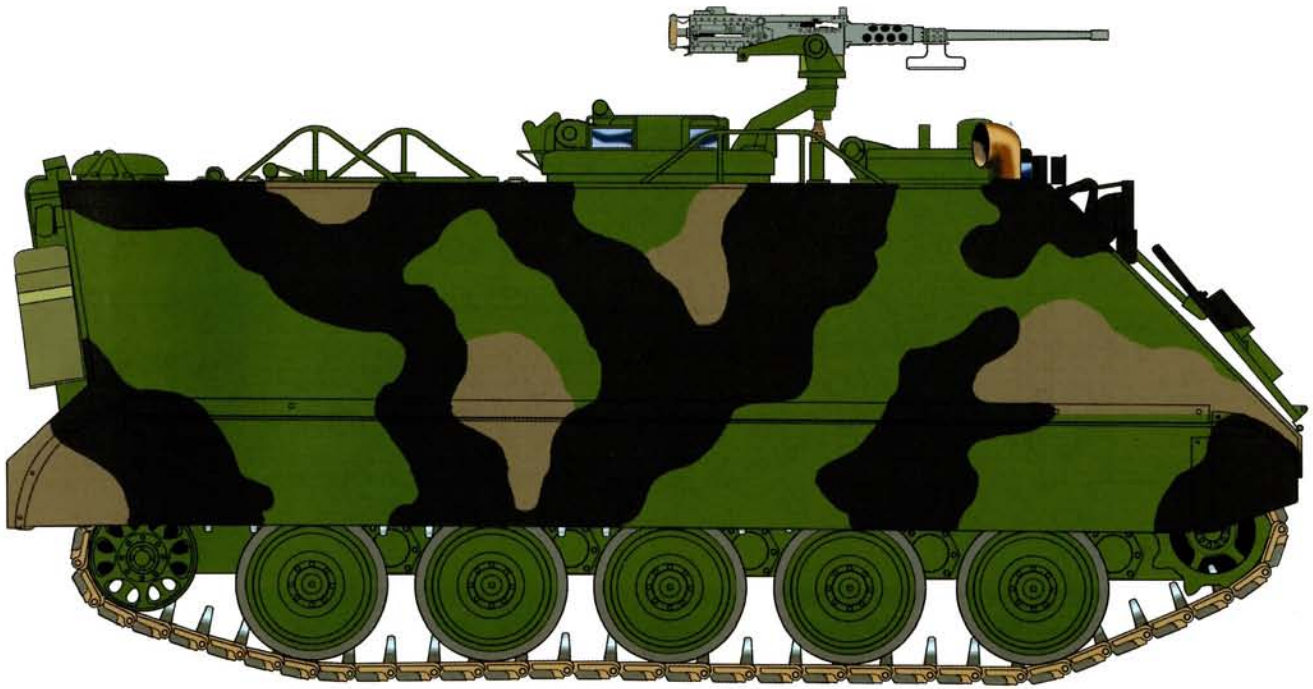
NATO Color Distribution

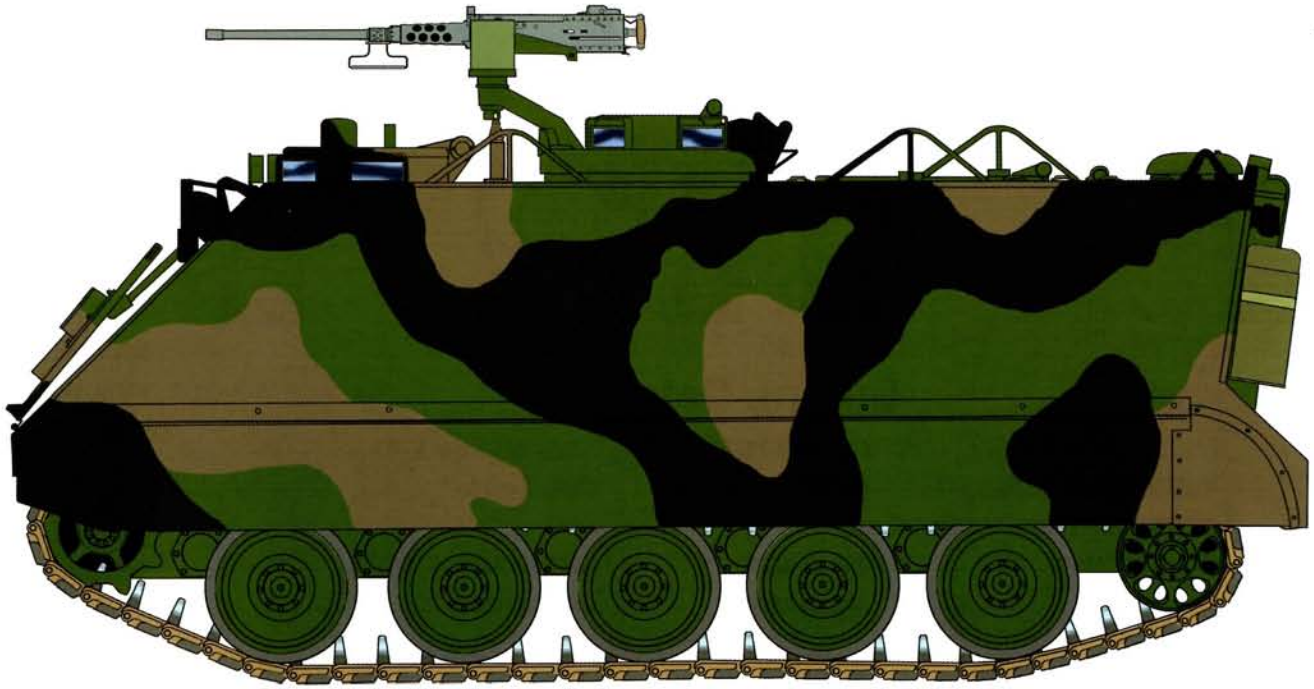
1	Black 37030
2	Green 34094
3	Brown 30051

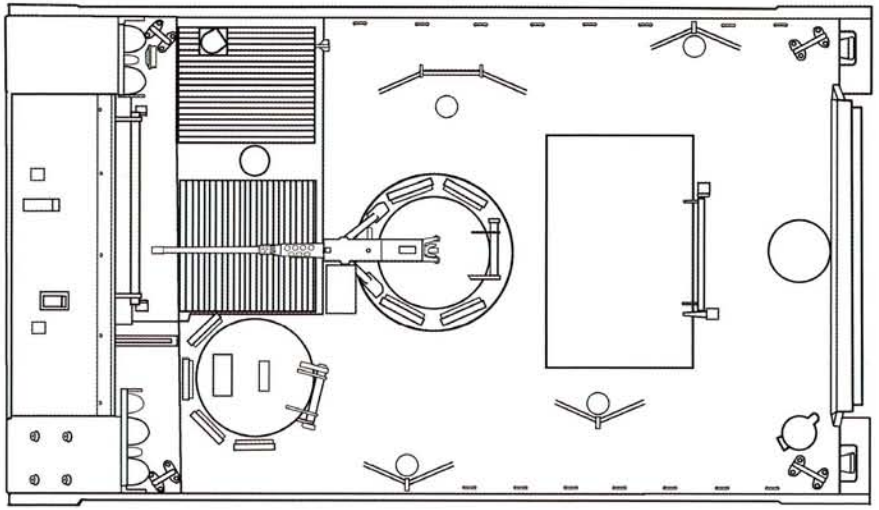




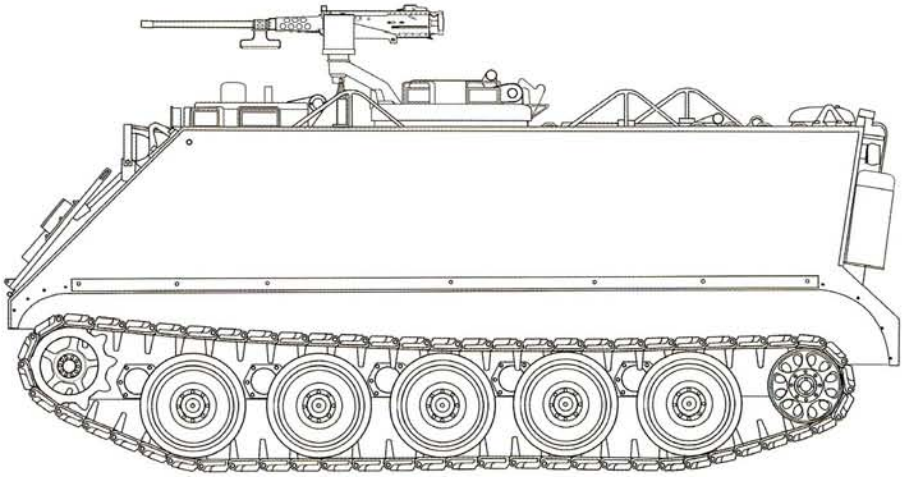




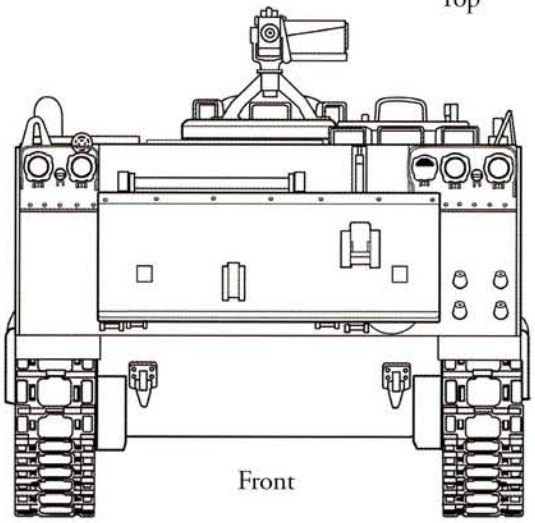




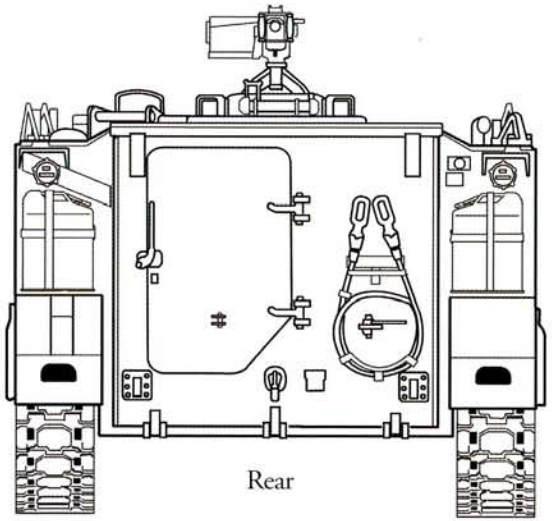
Top



Side



Front



Rear

Engine Data

ENGINE MAKE/MODEL	Chrysler 75M V-8	Detroit Diesel 6V53
NUMBER OF CYLINDERS	90 Degree V-8	V-6, 2 cycle
CUBIC INCH DISPLACEMENT	361	318
HORSEPOWER	215 @ 4000	212 @ 2800
TORQUE	332 @ 2800	492 @ 1300

Specifications

MODEL	M113	M113A1
WEIGHT	22,900 lbs.	24,080 lbs.
MAX TOWED LOAD	24,000 lbs.	24,000 lbs.
LENGTH	191.5 inches	191.5 inches
WIDTH	105.75 inches	105.75 inches
HEIGHT	98.25 inches	98.25 inches
TREAD	85	85
TRACK WIDTH	15 inches	15 inches
MAX SPEED	40 MPH	40 MPH
FUEL CAPACITY	80 gallons	95 gallons
RANGE LAND	200 miles	300 miles
ELECTRICAL	24V negative	24V negative
TRANSMISSION SPEEDS	6	3
TURNING RADIUS FEET	12 FT 7 IN	12 FT 7 IN

ISBN 978-0-89747-595-2
90000
9 780897 475952

Squadron Signal Publications